Part 2 – Project Technical Sections Specifications

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SECTION 01 10 00

SUMMARY OF THE WORK

1.01 GENERAL CONDITIONS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. The Sections of these Specifications entitled "Special Conditions, "Minimum Wage Determination," and Division 1 "General Requirements" (including, but not limited to “Unit Pricing”) shall apply and are hereby made a part of this section of the Specifications.

1.02 LOCATION OF WORK

The work of this contract shall be performed at the **Mason – Rice Elementary School, 149 Pleasant Street, NEWTON, MA 02459**

1.03 CONTRACT DESCRIPTION

A. In general, and without limiting the scope of this contract, the work consists of the replacement of the existing PVC membrane roof system with a new 30 year EPDM membrane roof assembly system.

1.04 GENERAL SCOPE OF WORK

A. The work consists of:

1. Roof system replacement for the **Mason – Rice Elementary School.**
   a. Provide a new mechanically fastened cover-board and adhered EPDM over the existing roof system. The retained existing PVC membrane to be cut away from all edges and transitions for acceptance of new cover board and 60 mil EPDM membrane as specified.
   b. Installation of new access hatch in existing opening where indicated on the drawings. Work shall include removal of infill to existing hatch openings.
2. Remove/replace all perimeter metal fascias throughout where new membrane roof system is indicated.
3. Install new nailers and blockings where indicated. Portions of exiting blocking to be retained and to be reused.
4. Remove and replace all scuppers, gutters and downspouts where noted.
5. Replace roof drains where indicated. Clean and reutilize all existing roof drains except where noted to be replaced. Replace entire drain if discovered to be damaged through unit pricing.
6. Remove and reinstallation existing exhaust fans, Louver Housings, intake hoods, roof and condensing units, etc. as required to install new roof flashings. Work also includes modification of curbs as necessary to meet minimum flashing height requirements.
7. Other work as indicated on drawings
8. The Owner under separate contract will have contractors on site performing other work activities. The roofing contractor shall coordinate work activities with of the Owner’s contractors for access into the building, egress of the building and around the exterior of the building.

B. The General Contractor shall furnish and do everything, except as otherwise provided by specified indications herein or on the drawings, necessary to complete the work in accordance with the plans and specifications. He/she shall furnish all plant, labor, materials, supplies, tools, water, machinery, implements, light, power, transportation, and other facilities required, and do all work necessary for the complete execution and completion of the contract, except that work or materials specifically stated to

be done or furnished by others.

C. All work and materials furnished and installed shall be of the best quality and workmanship, and to the satisfaction of the Architect. There shall be no defect in the work or the operation thereof due to inferior materials or the workman like placing of any part. The work under this contract shall be performed at such times as may be necessary to facilitate the orderly progress of the work, and so as not to interfere with the continued use of the building for school purposes. It is the intention of these specifications and plans to cover all work necessary and incidental to the completion of this project, including all trades, as shown on the drawings or specified.

D. It is required that the general contractor provide, for the project duration, a competent full-time project superintendent who is a Licensed Construction Supervisor in the state of Massachusetts.

E. Contractor shall do all necessary cutting and patching of structural and finish work as necessary to provide the finished results shown on the contract drawings and as herein specified.

1.05 PROJECT CONSTRUCTION COST ACCOUNTING

A. The contractor shall prepare a Schedule of Values within 10 days of Notice to Proceed / contract execution, to be used for establishing the breakdown of costs and for determining percentages of completion for monthly payments for this project.

B. The Schedule of Values shall include a complete breakdown of the costs for labor and material, separately, by building area of the various trades with further breakdown of each trade as required by the Architect. These Schedules of Values shall be submitted to and approved by the Architect prior to the submission by the contractor for the first Application for Payment and shall be used for all subsequent applications.

END OF SECTION

SECTION 01 14 00

WORK RESTRICTIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Site access restrictions.

B. Coordination of work with City Agencies and Newton Public Buildings Project Manager

C. Worker conduct, appearance and Work Rules.

1.2 WORK FORCE REQUIREMENTS

A. Work force requirements:

1. The General Contractor acknowledges the stringent requirements of the Owner with respect to the dates of Substantial Completion for various Portions of the Work, and recognizes that the construction schedule may require that work proceed on an accelerated basis. The General Contractor therefore agrees that the Work of his own forces and of his Subcontractors shall be performed on an overtime and/or double-shift basis if and to the extent necessary in order that the construction schedule be met.

2. Neither overtime nor double-shift work shall be grounds for any claims for compensation to the General Contractor or to any Filed subcontractors or subcontractor. If the nature of overtime of double-shift work requires that the Owner and their agents provide personnel to operate the facility at times when they would not normally be present, such personnel costs shall be borne or reimbursed by the General Contractor.

3. The General Contractor, subcontractors shall have access to the site through the fence gate(s) approved by the Owner. All other gate access to the site will require approval of the their site representative.

a. No vehicles (except fire, police and rescue) may enter or exit the construction sites from other gates unless authorized by the Owner.

b. Work schedule on site shall be Monday through Friday, 7:00AM to 5:00PM conforming to the **City of Newton** Ordinances and Bylaws. Any off hour work from times described above, the General Contractor will be required to get permission from the Town governing agency.

c. Prior to 7:00 AM any vehicle which arrives at the site during the “Closed Gate” time must move to a location acceptable to the Owner. Idling/parking on town streets is not permitted at any time. No vehicles will be allowed to idle on any other nearby street. The General Contractor shall be responsible for enforcing this requirement.

4. Commencement of Work: It is the responsibility of the General Contractor to provide materials and labors to maintain the fencing, erosion control and the stabilized construction entrance for the duration of the work on site.

5. Facility access: The existing school site and building is occupied with school personnel. The General Contractor is required to coordinate with the Owner’s Project Manager prior to scheduling Work areas.

6. Winter Conditions: The Owner and General Contractor recognize that time is of the essence for completion of this Contract and agrees to continue work throughout the winter months without delay or additional claim for costs to do so.
7. City Authority: The General Contractor shall comply with all local ordinances, including those with respect to work start, finish, and weekend work, including but not limited to any **City of Newton, MA** noise regulations.
8. None of the requirements herein shall be construed as relieving the General Contractor of his responsibility to conduct his operations in conformance with local ordinances or requirements established by the Commonwealth.

1.3 USE OF SITE

A. Use of, and access to, site will be subject to special requirements of the Owner, as directed.
   1. Prior to beginning the Work of this Contract, the General Contractor shall meet with the Owner and the Architect to determine procedures regarding access and use of the site, locations and access to staging and storage areas, tree protection, temporary barriers and fencing, and any special site conditions or restrictions regarding the use of the site areas surrounding the construction.
   2. Use of Owner's receiving/shipping areas and loading dock: General Contractor is responsible to deliver and receive all materials and equipment. General Contractor is not permitted to have supplies or equipment shipped directly to them in care of the Owner or Building Manager. All shipments will be refused.
   3. The Owner will supply storage facilities for equipment and furnishings scheduled for salvage and reuse.
   4. Security: Owner and their agent's access must be permitted at all times in all construction areas.

B. Confine operations to areas within Contract limits indicated on the Drawings. Portions of the site and building beyond areas in which construction operations are indicated are not to be disturbed.
   1. Use of on-site areas outside of the contract limits will not be permitted. Schedule imports / exports off site of machinery and equipment on to the site and going off site to minimize impact of the surrounding neighborhood and local streets. The General Contractor shall provide a schedule of times of equipment entering and exit the site, not to impact the high volume traffic periods during the day.
   2. The General Contractor, Filed subcontractors and subcontractors and their personnel are not permitted to use the School's cafeteria for eating or any school or adjacent Town facilities.

C. Keep all public roads and walks, and access drive to facility clear of debris caused by this Work during building operations.

1.4 SITE ACCESS RESTRICTIONS

A. Access to the site is restricted to established routes for safety of students and surrounding neighborhoods.

1.5 COORDINATION OF WORK WITH ADJACENT FACILITY OCCUPANCY

A. The Owner intends to occupy adjacent facility parking areas and access roads during construction. Notify the Owner of work which will affect the use of these areas; coordinate work schedule with Owner. The General Contractor shall consult with the Owner's Project Manager on the best ways to provide access, and on changes to access areas, as the work progresses, to perform the Work.

1. Take all measures to insure the safety of the general public. The General Contractor must take every reasonable precaution and employ all necessary measures including extra cleaning, special supervisory personnel, and additional temporary barriers and signage to facilitate the clean, quiet, safe, and continual operation during the demolition and construction of the addition and adjacent City facilities.
2. Suspension of Work: The Owner retains the right to temporarily suspend work at any time when the noise or disturbance created by construction proves disruptive to the academic activities of the adjacent facility or exceeding the limits of any **City of Newton, MA** noise regulations. The Owner may request of the General Contractor to utilize other means and methods, if practical, and acceptable to the Architect, which are less disruptive.

B. Interruption of services: Any major work entailing disruption to water, life safety systems, utility connections or other similar major disruption to the adjacent school must be closely coordinated with the Owner and local public safety officials, and temporary services, safety precautions, or connections provided. Do not shut down any service without approval of the Owner.

1. Provide 1 week notification for any possible disruption of service to Owner, Owner's Project Manager and Architect provide notification for connecting, disconnecting, turning on or turning off any service which may affect Owner's operations of the existing facility.
2. Provide 72 hour (3 work days) notice to the **Newton Fire Department** of disruptions in electrical services, fire alarm services, gas service and Electrical power services.
3. Any action either planned or unplanned, by the General Contractor, Filed subcontractors or subcontractors which impairs the operation of anyone or the activation of the fire alarm detection and or suppression system shall cause notification of the appropriate party. In case of unplanned, accidental, impairment, the General Contractor will immediately notify the Owner. The General Contractor should be prepared to provide assistance to correct the problem at its own expense.

1.6 WORKER CONDUCT, APPEARANCE AND WORK RULES

A. The conduct and appearance of each worker at the job site is of paramount importance. The Owner reserves the right to require any worker to be banished from the Site.

B. Privacy: Conduct all work of the Contract with the maximum effort to maintain the privacy of the Owner's operations, staff, and employees. Do not allow workers to peer into areas of the adjacent residential properties which are visible from the work area. Invasion of privacy is a major infraction of the work rules.

C. General Conduct and Demeanor: All construction workers shall treat all other workers, Owner staff, student and the public with respect and courtesy.

D. Physical Appearance: Require each worker to dress appropriately in a clean, neat, and professional manner.

1. Sleeved shirts and long pants are required minimum clothing. Short sleeved shirts may not be rolled up. Shirts may not be rolled up at the waist. Pants may not be rolled up past the top of the boots or shoes worn. Anyone not in compliance is subject to immediate dismissal.

E. Entertainment Devices (including, but not limited to radios, CD players, MP3 players and televisions): The use of all entertainment devices, including personal devices with headphones or earphones, is strictly prohibited at all times.

1. Control the volume of communication radios and loudspeakers to avoid creating a nuisance.

F. Smoking: Smoking is strictly prohibited on-site.

G. Alcoholic Beverages: Alcoholic beverages are strictly prohibited on-site.

H. Language: Foul and rude language is strictly prohibited.

I. Physical Actions: Running, horseplay, fighting, and other unprofessional conduct is prohibited. Fighting is a major infraction of the work rules.

J. Stealing: Stealing of any materials, objects, furnishings, equipment, fixtures, supplies, clothing, or other items will not be tolerated and is a major infraction of the work rules.

K. Sexual Harassment: All forms of physical and verbal sexual harassment will not be tolerated and is a major infraction of the work rules. Sexual harassment includes, without limitation: touching, taunting, whistling, sexually explicit stories, jokes, drawings, photos and similar representations, exhibitionism and all other sexually oriented offensive behavior.

L. Warnings and Dismissal:

1. For minor infractions of the rules, the Owner may issue a warning. Only one warning will be allowed per worker. A second infraction will result in immediate dismissal of the worker from the Site.
2. For major infractions of the rules, the worker shall be dismissed immediately without warning and is subject to possible criminal prosecution.

M. Notification of Workers: Clearly notify and educate each worker about these Work Rules and the requirements for worker conduct and appearance.

1. Recommendation: The Owner recommends that the General Contractor notify each worker of the work rules in writing and obtain a signed acknowledgment of the worker's understanding of the work rules as a condition of employment on this project.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

Section 01 25 13

PRODUCT SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Product options.
   1. Product selections.
   2. Visual matching.

B. Product substitution procedures.

C. Owner’s proprietary products.

1.2 RELATED REQUIREMENTS

A. Section 01 60 00 - PRODUCT REQUIREMENTS: Basic product requirements

1.3 PRODUCT OPTIONS

A. Product selections: Comply with the following for selection of products:
   1. Products specified by reference standards or by description only: Provide any acceptable product meeting those standards or description.
   2. Products specified by performance requirements only: Provide any acceptable product which has been tested to show compliance with specified requirements, including indicated performances.
   3. Products specified by naming one or more manufacturers with a provision for substitutions: Provide products of manufacturers named, or submit a request for substitution for any manufacturer or product not named.

B. Visual matching: Where Specifications require matching a sample, the Architect's decision on whether a proposed product matches is final. Where no product matches and complies with other requirements, comply with provisions for "substitutions" for selection of a matching product in another category.

1.4 PRODUCT SUBSTITUTION

A. Products specified by reference standards or by description only: Any product meeting those standards or description.

B. Pursuant to Massachusetts General Laws, Chapter 30, Section 39M(b), where products or materials are prescribed by manufacturer name, trade name or catalog reference, the word “or approved equal” shall be implied. The Architect will evaluate the proposed “equal” item on the following criteria:
   1. The submitted “equal” item is at least equal in quality, durability, appearance, strength and design,
   2. The submitted “equal” item is at least equal in function for the purpose intended by the design of the Work
   3. The submitted “equal” item conforms substantially to the detailed requirements for the items as indicated by the specifications.

C. The Architect's evaluation and decision on whether a proposed product is equal to that specified, based on the above evaluation requirements. The General Contractor retains the right to appeal the Architect's determination of equality through regulated statutory provisions.

1. The Architect and Owner reserve the right to reject proposed substitutions where data for VOCs is not provided or where emissions of individual VOCs are higher than for specified materials.

D. Owner's proprietary products: Under provisions of Massachusetts General Laws, Chapter 30, Section 39M(b) the Owner has determined that specific products shall be proprietary for 'sound reasons in the public interest'. This determination has been made under vote of the **Town or City** represented by the **Awarding Authority** and has been recorded in writing for public record.

1. Owner's proprietary products are listed under Section 01 60 00 and in respective individual Specification Sections.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

End of Section

SECTION 01 27 00
UNIT PRICES
(Submit with Bid Forms)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. Note: This list of Unit Prices shall be completed and included with the Bid Form.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for unit prices.

B. Related Sections include the following:

1. Section 06 10 00 Rough Carpentry
2. . Section 07 53 23 Roofing
3. Section 22 00 00 Plumbing

1.3 DEFINITIONS

1. Unit price is a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A list of unit prices is included in Part 2. Specification Sections referenced in the schedule contain requirements for Work described under each unit price. The unit prices provided will be used for ADD's and cover the description outlined below for each scope of work. Work not utilized under this section will be taken as DEDUCT's and will be taken at 15% less than the ADD price to account for overhead and profit.

PART 2 - LIST OF UNIT PRICES

DESCRIPTION	UNIT PRICE
Cost per linear foot for replacing deteriorated or unsuitable wood nailers and blocking (2-(2x6) with pressure treated type specified. New nailers and blocking shall be installed in accordance with FMG 1-49 fastening guidelines. (Section 07 53 23 Roofing) **Base bid shall include 200 lf of 2(2x6) above what is indicated on the drawings.**	_____
Cost per item to replace existing roof drain bowl assembly This cost shall include new strainers and clamp rings bowl and anchoring devices.(Section 22 00 00 Plumbing) **Base bid shall include 3 new drain assemblies above what is indicated on drawings (including new sump insulation).**	_____
Ref: Section 07 53 23: Cost per square foot for replacing existing deteriorated wet insulation at 5” thick with 1/8” taper above, removal of the existing roof system. (Section 07 53 23 Roofing) Prices should be based on a 5” thick polyiso insulation w/ 1/8” taper above **Base bid shall include 4000 sf. above what is indicated on the Drawings**	_____

END OF SECTION 01 27 00

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. Administrative Submittals:

1. Schedule of Values: Submit prior to first Application for Payment within 10 days of Notice to Proceed / Contract execution. Schedule of Values shall include but not limited to the following.
    a. Line item breakdown of labor and material with expenditures not to exceed $10,000 or as otherwise adequately defined by the work.
    b. Unit Price Bid scope items
    c. Shop drawings
    d. Closeout

2. Daily Construction Reports and Field Condition Reports: Compile and submit weekly.

3. Project Work Plan, including but not limited to, describing project sequence of work, building access, loading of materials on site and in building, coordination with Owner's occupants of building and site during construction, weekly two week look ahead schedule of work, delivery schedules, identifying and maintaining egress and entry access to the building and site with the owner's occupants at all times for life safety and operation of owner's activities. This work plan must be submitted and approved prior to mobilization on site.

4. CORI Forms
    a. Each employee of the General Contractor and Subcontractors that will be present on the project site must fill out a CORI form and present in person the form with a valid and legal picture identification card to the authorized CORI representative at the school for a criminal background check to be performed.
    b. The CORI representative will provide the General Contractor and Subcontractors with forms of identification for each employee of the Trade Contractors and Subcontractors that are cleared and authorized to be on site.
    c. A copy of each employee's identification card (hard hat sticker in lime green) must be visible at all times throughout construction activities. Anyone not displaying the identification card will be removed from site immediately and not allowed on site until proper identification is obtained.

C. Changes to the Work:

1. Changes Initiated by Architect: Respond to requests from the Architect for changes by preparing a proposed change order (PCO).

2. Changes Initiated by Contractor: Contractor may request a change to the Work upon encountering unforeseen conditions. Prepare a PCO substantiating increased costs necessary to address the condition.

3. Proposed Change Order (PCO): Provide detailed accounting of labor, materials, equipment rentals, and subcontracting costs necessary to complete the proposed work. Indicate: base labor rate and detail of markups for direct personnel expense; subcontractors' costs; quantities and unit costs of materials and

equipment; and mark-up for overhead and profit per contract requirements. Percentage for labor burden should in accordance with Supplemental Conditions. Include proposed changes to project schedule. Require subcontractors to include same level of detail. Include summary sheet reflecting total costs.

4. Approved PCOs will be incorporated into a Change Order prepared by the Architect.

D. Requests for Information:

1. Upon discovery of information required from the Architect, submit a written RFI to the Architect. Provide space on form for Architect's response.

2. Thoroughly describe information requested, including specific drawing and specification references. Include Contractor's proposed resolution.

3. Maintain detailed log of RFIs and distribute copy at project meetings.

E. Project Management:

1. Project meetings: Attend weekly progress meetings conducted by the Architect, with the Owner.

2. Construction Progress Schedule: Prepare schedule indicating start and stop dates, and project milestones. Update as work progresses, but no less than monthly from NTP. Submit prior to starting work, once per month, and when schedule changes.

F. Action Submittals: Prepare and submit Shop Drawings, Product Data, and Samples indicated. Improperly prepared submittals will be returned by the Architect without action for resubmittal.

1. Assign each submittal a unique submittal number. Indicate Project name, Contractor's name, name of subcontractor or supplier who prepared the submittal, Specification Section number, and Drawing number or detail references if applicable. Provide space for Architect's action stamp.

2. Contractor's Review: Affix Contractor's stamp indicating that the Submittal has been reviewed and approved by Contractor and coordinated with other Work.

3. Deviations: Highlight, circle, or otherwise specifically identify deviations from the Contract Documents. Failure to indicate deviations shall not relieve Contractor of obligation to provide work as indicated on Contract Documents.

4. Copies: Three for printed matter.

5. Distribution: Distribute copies of approved submittals to Owners (two copies), subcontractors, and suppliers, and maintain one copy at project site.

END OF SECTION

SECTION 01 31 00

CONSTRUCTION SCHEDULING AND PHASING

1.01 GENERAL CONDITIONS

A. The General Conditions together with all Amendments and Supplements as hereinbefore listed, shall apply and are hereby made a part of this section of the Specifications.

B. The Sections of these Specifications entitled "Special Conditions," "Minimum Wage Determination," and Division 1 "General Requirements" shall apply and are hereby made a part of this section of the Specifications.

1.02 SCOPE OF WORK

A. This section specifies the construction phasing and scheduling of the work.
   1. **The building project must be substantially completed by August 7, 2024**
   2. **Final Completion including Punch List and Closeout Documents by August 16, 2024**
   3. **The execution of work shall be tied into the specific areas on the CPM schedule. The sequence of work shall be in coordination with the Owner's preparation of the opening of the School. Final cleaning of the interior spaces shall be identified and coordinated with the Owner in preparation of occupancy.**
   4. Critical Path Method (CPM) scheduling of the Work.
      A. Definitions:
         1. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
            1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
            2. Predecessor activity is an activity that must be completed before a given activity can be started.
         2. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
         3. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.
         4. Event: The starting or ending point of an activity.
         5. Float: The measure of leeway in starting and completing an activity.
            1. Float time is not for the exclusive use or benefit of either Owner or Construction Manager, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Date of Substantial Completion.
            2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
            3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
         6. Fragment: An amplified portion of the CPM schedule, to study a special

sequence or establish a difficult time estimate, showing its predecessors, successors and impacts.

7. Major Area: A story of construction, a separate building, or a similar significant construction element.
8. Milestone: A key or critical point in time for reference or measurement.
9. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

B. General CPM Requirement: The General Contractor shall develop and maintain a Network Diagram to demonstrate fulfillment of the contract requirements and shall utilize the plan for scheduling, coordinating and monitoring the Work (including all activities of subcontractors, equipment vendors and suppliers). A conventional Critical Path Method (CPM) Precedence Diagramming Method (PDM) technique shall be utilized to satisfy both time and procurement applications.

C. Preliminary CPM Schedule: Submit for Architect's and Owner's review Critical Path Method (CPM) construction schedule in triplicate within 10 calendar days after date of commencement stated on Notice to Proceed and or execution of contract, whichever is sooner. Revise and resubmit as required.

1. Before the first progress payment can be approved, the General Contractor must have an approved CPM Schedule as described herein. It is the General Contractor's responsibility to submit the CPM schedule with sufficient time for review by the Owner and Architect and any re-submittals a n d corresponding reviews that may be necessary prior to approval of the first requisition.
2. Supporting data: Submit the following supporting data in addition to the CPM Plots:
    1. The proposed number of working days per week.
    2. The holidays to be observed during the life of the contract (by day, month, and year).
    3. The planned number of shifts per day.
    4. The number of hours per shift.
    5. List the major construction equipment to be used on the site, describing how each piece relates to and shall be used in support of the submitted network diagram work activities/events.

D. CPM Progress Schedule shall be as described below:

1. Network Diagram Plots, General: The network diagram shall be an activity or arrow diagram. The diagram shall show relationships between the various activities. Exercise sufficient care to produce a clear, legible and accurate network diagram. Group activities related to specific physical areas of the project, on the network diagram for ease of understanding and simplification. Provide a key plan on each network diagram sheet showing the project area associated with the work activities/events shown on that sheet.
2. Work Activities as a minimum include:
    1. All major and critical minor portions of the work.
        i. Break up the work into activities/events of a duration no longer than 10 work days each, except as to non-construction activities/events (for example: procurement of materials, delivery of equipment, curing times) and any other activities/events for which the Architect may approve the showing of a

longer duration.

2. Fabrication and delivery time for each item requiring off site fabrication.
3. Each mock-up and in-place sample.
4. Temporary facilities and controls.

3. Show not only the activities/events for actual construction work for each trade category of the project, but also trade relationships to indicate the movement of trades from one area, roof area, or building, to another area, roof, or building, for at least the major trades who are performing major work under this contract.
4. Identify all events on which the work is dependent on actions of Architect and Owner, including:
    1. Submittal of shop drawings, equipment schedules, samples, color submission, coordination drawings, templates, fabrication and material delivery times.
    2. Architect/Engineer's review of shop drawings, equipment schedules, samples and templates as defined under Section 01 33 00. General Contractor shall additionally schedule and allow for in the CPM Progress Schedule time for Architect's response to General Contractor's request for clarifications and interpretations of the Contract Documents. Time required for such activity, up to 5 or more days, is part of the normal construction process and is not a valid reason for extension of Contract Time, nor increase in the Contract Amount.
    3. Delivery times of equipment furnished under separate Contracts with Owner, where the Construction Manager has responsibility for installation or coordination.
    4. Test, balance and adjust various systems and pieces of equipment, maintenance and operation manuals, instructions and preventive maintenance tasks.
5. Activity Descriptive Information: identify the following for each work activity/event:
    1. Activity/Event ID number. (Uniquely number each activity/event. The network diagram should be generally numbered in sequence; left to right; top to bottom, and omitting numbers ending in 3, 6, and 9).
    2. Concise description of activity (35 characters or less including spaces preferred).
    3. Work location code, coordinated with key plan.
    4. Performance responsibility or trade code using defined and approved abbreviations.
    5. Nodes that correspond to the activities on the network diagram.
    6. Duration (in work days).
    7. Early Start (calendar day).
    8. Late Start (calendar day).
    9. Early Finish (calendar day).
    10. Late Finish (calendar day).
    11. Total float time.
    12. Manpower required (average number of men per day).
    13. Work Activity/Event Cost Data (as described below).

E. CPM Submittal Requirements: Submit three copies of Network Plots, and have approved an updated CPM prior to the approval of each progress payment.
   1. Plot format (each submittal): Colored plots (minimum 11 x 17 inches) and a CD-ROM disc.
   2. Plots and reports required:
      1. Network diagram plots.
         i. Bar chart plot.
         ii. Time logic plot.
         iii. Critical Path items of work only plot.
         iv. Early start and finish plot.
         v. Late start and finish plot.
         vi. Individual monthly activity plots for each month for the duration of the entire Contract.
      2. Activity List.
      3. Shop drawing and sample submittal schedule.
   3. Updates: Update and reissue the CPM Progress Schedule in coordination with each application for progress payment. Submission of complete and accurate monthly CPM Progress Schedules is a pre-requisite to the Architect's Certificate of Payment. The updated CPM; shall include the items specified herein above, in addition the updated CPM shall show the following:
      1. Changes to the Contract and their effect on the schedule and Activity/event costs.
      2. Delays in submittals, or deliveries, or work stoppage are encountered which make rescheduling of the work necessary.
      3. Revisions to schedule as required reflecting actual prosecution and progress of the Project. Show current status of activities completed or partially completed. Identify actual start dates and finish dates for each activity.
      4. Modifications to the Contractor's plan of action for future activities.

F. Work Activity / Procurement of Materials:
   1. Provide procurement of materials work activities/events related to work, guarantee period services, and system testing, balancing, adjustment, Closeout documents, interim and final cleaning.

G. Special CPM Progress Schedule Meetings: The Owner may require additional special CPM review meetings at any time during the Contract to review the CPM Progress Schedule updates.

H. Responsibility for Project Completion:
   1. Whenever it becomes apparent from the current progress review meeting or the updated CPM progress schedule that phasing or contract completion dates shall not be met, the General Contractor shall execute some or all of the following remedial actions:
      1. Increase construction manpower in such quantities and trades as necessary to eliminate the backlog of work.
      2. Increase the number of working hours per shift, shifts per working day, working days per week (pending approval of Owner), the amount of construction equipment, or any

combination of the foregoing to eliminate the backlog of work.

2. Prior to proceeding with any of the above actions, the General Contractor shall notify and obtain approval from the Owner's Representative for the proposed schedule changes. If such actions are approved, the CPM revisions shall be incorporated by the General Contractor into the network diagram before the next update, at no additional cost to the Owner.

I. Extension of Contract Time: Each time an extension of Contract Time is requested, submit the request with justification and evidence supporting the request and s u b m i t a completely revised and updated CPM Project Schedule showing the impact of the proposed extension of Contract Time on the Progress Schedule.

J. "Look Ahead" activity reports: Prepare each week throughout the term of construction a listing of upcoming construction activities. Each weekly report shall include a listing of planned construction activities for the following 10 days. Submit a Look Ahead Activity Report at each job meeting to all participants. If no meeting is planned on a given week, mail the reports directly to both Architect and Owner's Project Manager.

1. Maintain a record of all Look Ahead Activity Reports in a 3-ring binder in the Construction Manager's field office and make available for review by Architect and Owner's Project Manager.

1.03 SUBMITTALS

A. The contractor shall submit to the Architect for approval, a construction schedule in accordance with the requirements hereinafter specified. The CPM schedule shall be updated once a month, tied to the payment application requisition.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

3.01 COORDINATION

A. The existing school building will continue to be operated during the course of construction, by the **Newton Public Schools / Mason Rice Elementary School** during the time that the work under this contract is being performed.

B. During the course of the work the contractor shall, through a series of weekly meetings, continually appraise the Architect, the building committee representative and a **City of Newton** representative on the progress of the work, coordination issues and the scheduling of work yet to be done.

C. The contractor shall coordinate his work with the operating personnel in order that disruption to traffic flows and town office schedules are held to a minimum.

D. The moving of movable furniture and materials necessary for execution of the work of this contract will be done by the general contractor.

3.02 LIMITATIONS

A. Sewer, water, gas and electric services to the School shall not be disconnected or disrupted during the course of performing the work under this contract except during unoccupied hours when approved by

the Owner.

B. Utilities and paving shall be performed in accordance with an approved schedule established at the coordination and scheduling meetings.

C. Contractor's employee parking will be limited to designated areas on the site.

D. Contractors storage area shall be confined to the areas designed on the site. All storage areas shall be returned to their original condition.

E. The Contractor shall consult with the Chief of the **City of Newton Fire Department** on details of access routes for fire/emergency vehicles and appropriate signs (warning and information).

F. The contractor shall coordinate his work with the school schedule to prevent pedestrian or vehicle traffic problems on the property. Demolition should not present problems for fire or ambulance access to the building entrances.

G. Drilling, jack hammering and like noisy operations shall not be performed directly under, over or adjacent to occupied spaces. The contractor shall consult with the Architect and owner and ascertain when spaces will be unoccupied at which time such operations may be performed.

H. The Owner may exercise the option to permit minor alterations to be performed in occupied spaces during periods when they are not in use. The spaces shall be left broom clean at the end of each work period. Failure to maintain these occupied spaces in a clean condition will cause discontinuance of remodeling work in occupied spaces until such time as they can be vacated.

I. Temporary entrances and fencing required to provide safe legal exits and entrance to the existing building shall be constructed as necessary and shall be complete and inspected and approved by the Building Inspector.

J. Exits shall be properly lighted and maintained clear of construction at all times.

K. No construction materials shall be stored in such a way as to interfere with entrances and exits to the buildings and access to walks and playfields.

L. All areas disturbed by the Contractor's operations shall be returned to their original condition.

M. Contractor shall survey the building prior to the start of construction to document all areas of existing damage. Contractor shall submit all documentation of pre-existing damage to Owner electronically.

END OF SECTION

Section 01 31 10

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Project coordination.
B. Project site administration.
C. Daily project photographs showing progression of work activities and distribution on a daily basis to project team. Provide complete closeout photography history of work activities at completion and to be included in final closeout documents
D. Project meetings.

1.2 RELATED SECTIONS

A. Section 01 33 24 – ELECTRONIC SUBMITTAL PROCEDURES.
B. Section 01 73 29 - CUTTING AND PATCHING.
C. Section 01 78 00 - CLOSEOUT SUBMITTALS: Requirements for Project Record Drawings (As-built drawings).

1.3 GENERAL PROJECT COORDINATION

A. Coordination: The General Contractor is fully responsible for coordinating the Work of this Contract including scheduling, submittals, Work and other activities included in various Sections to assure efficient and orderly sequence of installation of interdependent construction elements. The General Contractor is responsible for coordinating actual installed location and interface of work, and to make provisions to accommodate items scheduled for later installation.

B. Where installation of one component depends on installation of other components before or after its own installation, schedule activities in the sequence required to obtain efficient installation with the least amount of alterations, or cutting and patching, to completed Work.

1. The General Contractor shall be responsible to uncover work completed in order to install ill-timed work, at no additional cost to the Owner.

C. Where space is limited, coordinate installation of different components to assure maximum accessibility for maintenance, service and repair.

D. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other

installations, for maintenance, and for repairs.

E. Verify that utility requirement characteristics of operating equipment are compatible with building utilities. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service such equipment.

F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

G. Coordinate completion and clean up of Work of separate Sections in preparation for Substantial Completion and Owner's occupancy.

H. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.4 UTILITIES, MECHANICAL AND ELECTRICAL COORDINATION

A. Coordinate all Work of this Project. Provide full and complete coordination for utilities, mechanical and electrical work in Divisions 11, 13, and 21 through 28, with Work of other Divisions.

1. Each Filed Sub Contractor and subcontractor shall compare his drawings and specifications with those of other Trades and report any discrepancies between them to the General Contractor. The General Contractor shall obtain from the Architect written instructions for changes necessary in the mechanical or electrical work, to ensure that all work is installed in coordination and cooperation with other Trades installing interrelated work. Before installation, each Filed Sub / Sub Contractor shall make proper provisions to avoid interferences in a manner approved by the Architect. All changes required in the work of each Filed Sub / Sub Contractor caused by his negligence, shall be corrected by him at his own expense, to the Architect's satisfaction.

B. Give all advance notice to public utility companies as required by law, and provide proper disposition, subject to Architect's approval of all existing pipe lines, conduits, sewers, drains, poles, wiring, and other utilities that in any way interfere with the Work, whether or not they are specifically shown on the Drawings.

C. Coordination regarding existing utilities:

1. Notify Owner and appropriate authorities when coming across an unknown utility line(s), and await decision as to how to dispose of same.
2. When an existing utility line must be cut and plugged or capped, moved, or relocated, or has become damaged, notify the Owner and utility company involved, and assure the protection, support, or moving of utilities to adjust them to the new work.

3. The General Contractor shall be responsible for all damage caused to existing, active utilities located within the limits of this Contract, whether or not such utilities are shown on the Drawings, including resultant damages or injuries to persons or properties.

D. General coordination of piping, ductwork, conduits and equipment:

1. The Contract Drawings are diagrammatic only intending to show general runs and general locations of piping, ductwork, equipment and sprinkler heads.

   Determine exact routing and location of individual systems prior to fabrication of components or installation.

   a. Piping runs requiring pitch have “right-of-way” over those systems what do not pitch.

   b. System components whose elevations cannot be changed have “right-of-way” over those components whose elevations can be changed.

2. Adjust locations of piping, ductwork, conduits and equipment as required to accommodate new work with interferences anticipated and as encountered during installation.

   a. Locate piping, conduits and ductwork to be clear of swinging doors, access doors, and clear for unimpeded equipment access.

3. Provide all offsets, transitions and changes of direction for all systems, as may be required to maintain proper clearances for headroom, and as may be required for coordination with other “fixed-in-place” building components (such as structural systems).

   a. Furnish all vents, drains and similar accessories as may be required for offsets, transitions and changes of direction.

4. Provide openings in the work for penetration of mechanical and electrical work.

5. Coordinate final locations of ceiling mounted devices (including air distribution devices, thermostats, heaters, control devices, sprinkler heads and similar work) with reflected ceiling plans. Review locations with Architect and obtain approval of all devices prior to installation.

1.5 COORDINATION DOCUMENTS

A. General: Prepare coordination drawings for areas where close coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space necessitates maximum utilization of space for efficient installation of different components.

1. Coordination Drawings include, but are not necessarily limited to:

   a. Structure.

   b. Partition and room layout.

   c. ¼ inch scale elevation drawings of all masonry walls with reinforcement and all mechanical, electrical, plumbing and fire

protection penetrations

d. Ceiling layout and heights.
e. Light fixtures.
f. Access panels.
g. Sheet metal, heating coils, boxes, grilles, diffusers, and similar items.
h. All heating piping and valves.
i. Smoke and fire dampers.
j. Soil, waste and vent piping.
k. Food service equipment and appurtenances.
l. Major water.
m. Rain water drainage piping.
n. Major electrical conduit runs, panelboards, feeder conduit and racks of branch conduit.
o. Above ceiling miscellaneous metal.
p. Sprinkler piping and heads.
q. All equipment, including items in the Contract as well as OFCI and OFI items.
r. Equipment located above finished ceiling requiring access for maintenance and service. In locations where acoustical lay-in ceilings occur, indicate areas in which the required access area may be greater than the suspended grid system.
s. Seismic Restraints.

B. Timing: Prior to fabricating materials or beginning work, supervise and direct the creation of one complete set of coordination drawings showing complete coordination and integration of work, including, but not limited to, structural, architectural, mechanical, plumbing, fire protection, elevators, and electrical disciplines.

C. Intent: Coordination drawings are for the General Contractor's Filed Sub / Sub Contractor's and subcontractor's use during construction and are not to be construed as replacing shop drawings or record drawings. Architect's review of submitted coordination drawings shall not relieve the General Contractor from his overall responsibility for the coordination of the Work of the Contract.

D. Base sheets: Architect will provide CAD files for use by the General Contractor for the development of building coordination drawing "base sheets" upon signed receipt of Architect's disclaimer form. General Contractor is responsible to prepare and provide one accurately scaled set of building coordination drawing "base sheets" on reproducible transparencies showing all architectural and structural work. Base sheets shall be at appropriate scale; congested areas and sections through vertical shafts shall be at larger scale.

1. Highlight all fire rated and smoke partitions.
2. Indicate horizontal and vertical dimensions to avoid interference with

structural framing, ceilings, partitions, and other services.

3. Indicate elevations relative to finish floor for bottom of ductwork and piping and conduit (6 inches and greater in diameter).
4. Indicate the main paths for the installation, or removal of, equipment from mechanical and electrical rooms.

E. General Contractor shall circulate coordination drawings to the following subcontractors and any other installers whose work might conflict with other work. Each of these subcontractors shall accurately and neatly show actual size and location of respective equipment and work. Each subcontractor shall note apparent conflicts, suggest alternate solutions, and return drawings to General Contractor.

1. Plumbing Trade Contractor.
2. Heating ventilating and air conditioning Trade Contractor(s).
3. Electrical discipline Trade Contractors.
4. Control system Trade Contractors.

F. Review and modify and approve coordination drawings in cooperation with individual installers and Filed Sub / Sub Contractor to assure conflicts are resolved before work in field is begun and to ensure location of work exposed to view is as indicated or as approved by Architect.

1. The General Contractor shall stamp, sign and submit coordination drawing originals to Architect for review.
2. Do not commence work in areas described in the coordination drawings until receipt of Architect's comments.
3. Submit electronic files of final coordination drawings to the Architect in suitable format.

1.6 GENERAL PROJECT ADMINISTRATION

A. Prepare memoranda for distribution to each party involved outlining required coordination procedures. Include required notices, reports, and attendance at meetings.

B. Daily progress photographs taken by general contractor showing progress of work activities. Distribution of photograph on a daily basis to project team. Provide complete closeout photography history of work activities at completion and to be included in final closeout documents

C. Prepare similar memoranda for the Owner and separate Construction Managers where coordination of their Work is required.

D. Conduct conferences among Filed Sub Contractors, subcontractors and others concerned with the Work, to establish and maintain coordination and schedules, and to resolve coordination matters in dispute.

E. Administrative Procedures: Coordinate scheduling and timing of administrative procedures with other activities to avoid conflicts and ensure orderly progress. Such activities include:

1. Preparation of schedules.
2. Installation and removal of temporary facilities.
3. Delivery and processing of submittals.
4. Progress meetings.
5. Project Closeout activities.

1.7 SITE MOBILIZATION CONFERENCE

A. Prior to commencement of the Work, schedule a meeting at a meeting room provided by the General Contractor.

1. Attendance is required by Architect, General Contractor, engineering consultants, Construction Managers' Project Manager and Superintendent, General Contractor's, Filed Sub / Sub Contractor, and other major subcontractors, applicators, installers and suppliers. Other persons are required to attend as the Architect may direct or the General Contractor may wish to have present.

2. Items of Agenda:
   a. Use of premises by Owner, General Contractor, and subcontractor(s).
   b. Owner's requirements and partial occupancy considerations.
   c. Demolition procedures, identity tagging of existing furnishings and equipment for salvage or disposal.
   d. Temporary utilities.
   e. Barricading and protection of the public, dust barriers.
   f. Survey and building layout conditions.
   g. Wetlands protection.
   h. Potentially difficult areas of work.
   i. Project coordination.
   j. Construction-waste management and recycling procedures.
   k. Security and housekeeping procedures.
   l. Construction schedules.
   m. Work beyond Contract Limit.
   n. Procedures for testing and inspection.
   o. Procedures for maintaining record documents.
   p. Requirements for equipment start-up.
   q. Inspection and acceptance of equipment put into service during construction period.

1.8 PRE-INSTALLATION/PRE-FABRICATION CONFERENCES

A. When required in individual specification sections, prior to commencing the work of that trade, convene a pre-installation conference at work site, if possible, on same day as weekly progress meeting.

B. Notify Architect and Owner's Project Manager a minimum of one week in advance of meeting date.

C. Attendance is required by General Contractor's Project Manager and Superintendent, and parties directly affecting, or affected by, work of the Section.

1. General Contractor shall include discussions on waste management goals and requirements in all pre-fabrication meetings conducted with subcontractors, fabricators, and vendors.

1.9 COORDINATION MEETINGS

A. In addition to other specified meetings and additional meetings as required. General Contractor shall hold project coordination meetings, at least monthly at regularly schedule times. Hold meetings more frequently when necessary to ensure full coordination of work. Request representation at each meeting by every entity involved in coordination or planning for work of the entire project. Conduct meetings in a similar manner to progress meetings, to resolve coordination problems.

B. Keep minutes of coordination meetings and distribute copies to all attendees, related parties and to Owner, Owner's Project Manager, Architect and its engineering consultants within 3 business days following meeting. Coordination meetings shall continue on an appropriate schedule, even after completion of coordination drawings by General Contractor, to review progress and resolve minor conflicts not identified in the coordination drawings.

C. The following trades shall participate in coordination meetings, preparation of coordination drawings and reviews. Additional trades shall participate as the General Contractor deems necessary for proper coordination of the Work.

1. Concrete work
2. Masonry.
3. Structural steel, light gage metal framing and metal fabrications.
4. Rough carpentry.
5. Air and vapor barrier work.
6. Finish wall and ceiling construction.
7. Plumbing systems, including roof drainage, waste and vent systems and distribution.

8. Ductwork including appurtenances and equipment.
9. HVAC piping.
10. HVAC equipment and controls.
11. Electrical lighting, power, communications and signaling, fire detection and related systems.
12. Excavation, site utilities and site improvements.

D. All adjustments necessary to achieve full coordination shall be determined in a timely manner, so as not to delay the work. Include time necessary for consideration by the Architect and Owner's Project Manager for proposed modifications. No claim for additional compensation for extension of time arising from delays due to failure of General Contractor to identify potential conflicts requiring coordination in a timely manner or from additional work made necessary by such failure will be valid.

1.10 PROGRESS MEETINGS

A. The Owner's Project Manager will schedule and administer meetings throughout the progress of the Work at regular intervals; make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes and distribute copies within 24 hours to Architect, Owner and participants, and to those affected by decisions made. Architect will review and send comments within 2 working days from receipt of minutes.

1. Scheduled Frequency of Meetings: Weekly.

B. Attendance: Required are General Contractor's Project Manager and Project Superintendent, and each Filed Sub Contractor, applicator, installer, and supplier whose work is on-going or scheduled. Owner, Architect, engineering consultants, and other persons are required to attend as the Architect may direct. Subcontractors, vendors, suppliers shall be present at meetings upon request of General Contractor.

1. Attendee Authority: Trade Contractors, subcontractors and supplier representatives present at meetings shall have authority to act for and make commitments for, the entity which they represent.
2. Restricted Attendance: Owner's Project Manager reserves the right to expel or exclude from any Progress Meeting any person(s) or company representative(s) without statement of reason or excuse.
3. Attendance of Architect's Consultants: Construction Manager shall make an attendance request to the Owner's Project Manager for specific Architect's consultants and engineers at least 72 hours in advance of the meeting. Clearly identify In the request all consultant related issues and topics to be discussed at the meeting. The Architect will decide if its consultant or engineer will attend.

C. Items of Agenda:

1. Review minutes of previous meetings.

2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identifications of problems which impede planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Coordination of projected progress.
10. Maintenance of quality and work standards.
11. Progress of Work to be adjusted under coordination requirements, and effect of proposed changes on progress schedule and coordination.
12. Review of construction waste management and recycling performance, material quantities disposed and diverted for recycling.
13. Sustainable Certification Progress Report.
14. Other business relating to Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 33 24
ELECTRONIC SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. DIVISION 00 and 01 are hereby made part of this SECTION.

B. Examine all conditions as they exist at the project prior to submitting a bid for the work of this SECTION.

1.02 SUMMARY

A. Shop drawing and product data submittals shall be transmitted to Architect in electronic (PDF) format using online project management service such as Submittal Exchange, Sage Timberline, or equal pre-approved website service designed specifically for transmitting submittals between all construction team members.

1.03 PROCEDURES

A. Submittal Preparation - Contractor may use any or all of the following options:

1. Subcontractors and Suppliers provide electronic (PDF) submittals to Contractor via the online project management software.
2. All electronic PDF Files shall in have a schedule and be bookmarked.
3. Subcontractors and Suppliers provide electronic (PDF) submittals to Contractor via email.
4. Subcontractors and Suppliers provide paper submittals to Scanning Service which electronically scans and converts to PDF format.
5. Submittals shall include:

a. Date and revision dates

b. Project title and number

c. The names of:

1) Architect
2) General Contractor
3) Sub-contractor
4) Supplier
5) Manufacturer
6) Separate detailer when pertinent

d. Identification of product or material

e. Relation to adjacent structure or materials

f. Field dimensions, clearly identified as such

g. Specification section number - format is to include spec section, submittal name and number and revision. No other system will be accepted. This would apply to all ID of the submittal on transmittals and the pdf naming. Electronic copies of submittals are to be up-loaded to the architect's ftp site in the established folder hierarchy. **ex. 23 00 00-010-01 FIXTURES equates to Section 23 00 00, submittal number 10, revision 1**

h. Applicable standards, such as ASTM number

I. A blank space, five-inch by four-inch, for designer's stamp

j. Identification of deviations from contract documents

k. General contractor's stamp, initialed or signed certifying review and approval of submittal.

B. Re-submission Requirements:

1. Product Data and Samples: Submit new data and samples as required from previous submittals.

2. **All comments marked on the returned submittals are to be cataloged and specifically addressed and acknowledged as acceptable or un-acceptable to the contractor within 10 days of return receipt via specific transmittal. This is to ensure that the comments are understood and are either to be incorporated or contested. Any and all work incorporated into the finish product that does not conform to the submittal comments will be rejected and required to be replaced at the contractor's monetary and schedule expense.**

3. **All comments marked on any returned submittal are assumed to be incorporated into all subsequent submittals and the architect will take no responsibility for any omissions.**

C. Printed Submittals: Provide two printed sets of submittals for shop drawings for structural framing in addition to electronic submittals.

D. Contractor shall review and apply electronic stamp certifying that the submittal complies with the requirements of the Contract Documents including verification of manufacturer / product, dimensions and coordination of information with other parts of the work.

E. Contractor shall transmit each submittal to Architect using the electronic submittal website.

F. Architect / Engineer review comments will be made available on the online project management service website for downloading. Contractor will receive email notice of completed review.

G. Submit paper copies of any reviewed submittals not submitted electronically

at project closeout for record purposes in accordance with SECTION 01 70 00 – CONTRACT CLOSEOUT.

1.04 COSTS

A. General Contractor shall include the full cost of the electronic submittal project subscription in their bid.

1.05 PRODUCTS

A. Basis of specification is Submittal Exchange website system for electronic construction submittals, Sage Timberline, or equal.

B. Substitution may be considered if proposed service meets or exceeds all features listed in this Section.

1. Independently hosted, web-based system for automated tracking, storage, and distribution of contract submittals, Requests For Information, and other contract related documents. FTP sites, e-mail exchanges, and server-based systems hosted from inside a contractor's office will not be considered are not acceptable.
2. Minimum five years documented experience of use on commercial construction projects.
3. Unlimited individual user accounts and system access for all project subcontractors, general contractor, owner staff, architect, design consultants, and sub-consultants, with no additional fees for those parties to access the system.
4. Full version histories and dates of exchanges automatically tracked and available for viewing, searching, and reporting in a linear log format compatible with AIA G712.
5. Functionality to group submittals as required packages and apply forms and review comments to entire package simultaneously.
6. Functionality for integrated online PDF viewing and review, including graphical markups and stamps, for owner, architect, design consultants, sub- consultants, and general contractor without need for additional software purchase.
7. Automatic, configurable email notifications for each project team member for new and reviewed submittals and other items.
8. Customized, automated PDF form generation for submittals, RFIs, and other documents matching standard templates used by owner, design consultants, sub-consultants, and general contractor. Documentation and demonstration of automatic form generation using each entity's templates must be submitted as part of any substitution request.
9. Prior to project start, system vendor shall create submittal log with all required items from project manual or submittal register. Owner or primary design consultant shall have full control over required items list and access to edit, add, or remove items during project.

10. System vendor shall provide access for owner, design consultants, sub- consultants, general contractor, and subcontractors to live technical support by phone and email minimum of 7 AM to 6 PM CST on standard business days at no additional cost.

11. At completion of project closeout, system vendor shall provide minimum of four archival discs that include all documents and tracking logs, or the ability to download this information from the live website in a single complete archive package.

12. Design component must include automatic notifications to design team during the design phase. Additionally will include project milestones, public plan room, and the ability to do markups in multiple locations.

END OF SECTION

SECTION 01 35 00
SPECIAL PROJECT PROCEDURES

PART I – GENERAL

1.01 SAFETY REGULATIONS

A. This Project is subject to compliance with Public Law 92-596 "Occupational Safety and Health Act of 1970" (OSHA), with respect to all rules and regulations pertaining to construction including Volume 36, numbers 75 and 105, of the Federal Register as amended, and as published by the U.S. Department of Labor.

B. The committing of nuisances on the site or adjacent property is prohibited.

1.02 SAFETY PRECAUTIONS

A. The **Contractor** shall take all precautions to safeguard the health and wellbeing of all workers and all others rightfully on the Project site who may be affected by work done under this Contract.

B. All safety laws and regulations of the Commonwealth of Massachusetts applicable to work performed under this Contract shall be adhered to by the **Contractor**.

1.03 LEGAL RELATIONS/RESPONSIBILITY TO PUBLIC

A. Laws to be Observed:

A.1 The **Contractor** shall keep himself fully informed of all existing and future State and National Laws and Municipal ordinances and regulations in any manner affecting those engaged or employed in the Work, or the materials used or employed in the Work, or in any way affecting the conduct of the Work, and all such orders and decrees of bodies or tribunals having any jurisdiction or authority over the same and of all provisions required by Law to be made a part of this Contract, all of which provisions are hereby incorporated by reference and made a part hereof. The **Contractor** shall cause all Subcontractors, Suppliers, agents and employees to observe and comply with, all such existing and future Laws, ordinances, regulations, orders and decrees.

A.2 If the **Contractor** uses or stores toxic or hazardous substances he is subject to certain additional laws and regulations including but not limited to M.G.L. Chapter 111F, Section 2, (the "Right to Know" law) and regulations promulgated by the State Department of Public Health, the Department of Public Safety and those of City of Boston agencies.

1.04 FIRE PROTECTION AND PREVENTION

A. The **Contractor** shall keep the building and Project site free of rubbish and debris at all times.

A.1 The **Contractor** shall provide metal barrels located on each floor and other appropriate areas into which all refuse and garbage shall be deposited. All barrels shall have tight fitting covers.

A.2 At the end of each work week, the **Contractor** shall thoroughly clean the buildings and Project site of all rubbish and debris of any nature and remove such from the premises.
A.3 In addition to the requirements in this Section, the **Contractor** shall, until Final Completion of the Work, provide and maintain fire extinguishers ready for use distributed around the Project and in and about

temporary structures.

A.4 Gasoline and other flammable liquids shall be stored in and dispensed from UL listed safety containers in conformance with the National Board of Fire Underwriters recommendations and the Commonwealth of Massachusetts Department of Public Safety requirements, and in no event within the confines of the permanent structures.

A.5 All tarpaulins used shall have UL approval and comply with Federal Specifications CCC-C746. Polyethylene shall not be used.

1.05 RUBBISH REMOVAL

A. The **Contractor** shall remove all rubbish, waste, tools, equipment, and appurtenances caused by and used in the execution of the Work; but this shall in no way be construed to relieve the **Contractor** of his primary responsibility for maintaining the building and Project site clean and free of debris, leaving all work in a clean condition satisfactory to the **Official**.

B. Immediately after unpacking, the **Contractor** shall collect and remove from the building and Project site all packing materials, case lumber, excelsior, wrapping, and other rubbish.

1.06 SITE DRAINAGE AND PUMPING

A. The **Contractor** shall be responsible at all times for proper and sufficient site drainage and shall maintain such drainage during the life of the Contract in a manner acceptable to the **Architect** and so as not to adversely affect the adjacent areas.

B. The **Contractor** shall provide and maintain all pumps, suction and discharge lines, and power in sufficient number and capacity to keep all excavations, pits, trenches, foundations, and the entire property area free from accumulation of water from any source whatsoever at all times and under all circumstances and contingencies that may arise.

C. For additional requirements of excavation and dewatering, refer to SPECIFICATION SECTION entitled "EARTH WORK AND SITE PREPARATION".

1.07 SNOW AND ICE REMOVAL

A. The **Contractor** shall promptly remove all snow and ice which may impede the work, damage the finishes or materials, be detrimental to all/any crafts or trade impede trucking delivery and Fire Truck access or moving of materials at the site, or prevent adequate drainage of the site or adjoining areas.

1.08 WINTER CONSTRUCTION

A. The **Contractor** shall provide protection against damage to materials and work installed in freezing weather, including special heat and coverings to prevent damage by the elements. The ground surface, under footings, under pipe lines, under masonry, under concrete, and other work subject or damage shall be protected against freezing or ice formations.

B. Refer to SECTION 01 50 00 - TEMPORARY FACILITIES, for additional requirements applicable to winter construction.

1.09 BROKEN GLASS

A. The **Contractor** shall be held responsible at all times prior to Substantial Completion of the Work, or occupancy by the **City**, whichever occurs first, for all broken or scratched glass, or glass which had been

damaged as a result of the Work, or otherwise and, when so directed by the **Official**, the **Contractor** shall replace at no increase in Contract Price or Contract Time, all such glass broken, missing, or damaged prior to Substantial Completion.

1.10 CLEANING AND POLISHING

A. The **Contractor** shall at all times keep the site free from accumulation of waste materials or rubbish.

B. Immediately prior to final inspection, the entire building and surrounding Project areas shall be thoroughly cleaned by the **Contractor** including, without limitation:

B.1 All construction facilities, tools, equipment, surplus materials, debris, and rubbish shall be removed from the Project site and the entire Work shall be left broom clean.

B.2 All finished surfaces shall be left in perfect condition, free of stains, spots, marks, dirt, and other defects. The **Contractor** shall be responsible for the cleaning and polishing of the Work of all trades, whether or not cleaning by such trades is included in their respective Sections of the Specifications.

B.3 All glass shall be washed and polished on both sides.

B.4 All metals, hardware, fixtures, and equipment shall be left in undamaged, bright, polished condition.

B.5 All filters shall be replaced and plenums, duct spaces, and furred spaces shall be left clean of debris and decayable materials.

C. In cleaning, items having manufacturer's finish, or items previously finished by a Subcontractor, care shall be taken so as not to damage such finish. In cleaning glass and finish surfaces, care shall be taken not to use cleaning agents which may stain any finish materials. Any damage to finishes caused by operations shall be corrected and repaired by the **Contractor** at no increase in Contract Price.

1.11 OPERATIONS IN OCCUPIED STRUCTURES

A. The Contractor shall segregate all work from the public and/or user group or work force. The Contractor shall submit to the Owner’s Representative the method of segregation for approval before start of any work.

B. The Contractor shall ensure that its agents and employees, including agents and employees of all subcontractors, not have any direct and unmonitored contact with children at any time on the Site.

C. In the event that the Contractor believes a portion of the Work cannot be completed without possible direct and unmonitored contact with a child, Contractor shall notify the Owner’s representative and obtain prior written consent before proceeding with that portion of the Work. Workers who may have direct and unmonitored contact with children will be subject to verification of the Criminal Offender Record Information (CORI).

1.12 CONSTRUCTION SCHEDULE AND PROJECT OCCUPANCY

A. The Contractor will have to schedule operations per a phasing plan to be coordinated with the BPFD to accommodate the day to day operations of the School. Construction is expected to commence during the Summer of 2020 while the school building is unoccupied and be completed in the Fall while the school building is occupied.
B. The General Contractor will be required to meet the following schedule for the progress and completion of the Work. In addition to the project schedules required under other Sections, the General

Contractor will provide a phasing plan and schedule updated weekly showing where work will be occurring and which work tasks will be completed. The Phasing Schedule should provide a minimum 3 week look ahead and will be approved by the City Official prior to implementation.

C. Schedule:

1.13 WORK HOURS – *To Be Confirmed*

A. Monday thru Friday – 7:00 am – 5:00 pm. Work allowed on Saturdays with permit from ***City of Newton Inspectional Services***

A. Extended work hours (hours exceeding 8 hours per day, 40 hours per week or 32 hours per week when the week includes a legal holiday) used by the General Contractor to meet milestones and completion dates will require the General Contractor to pay overtime costs for one (1) Clerk.

1.14 BIDDERS INSPECTION OF EXISTING BUILDING AND SITE

A. All bidders are strongly encouraged to inspect the existing conditions at the Schools and make their own assessment of the work required to achieve the finished conditions specified in the Contract Documents in light of existing conditions.
B. Failure to adequately inspect the site and/or to incorrectly assess existing conditions shall not be cause for extra payment to achieve the work required under the contract.
C. Every Contractor will be bound by the scope of work required by the Contract Documents and must make whatever inspections he deems necessary to assure that the bid price includes the complete scope

1.15 CONTRACTOR'S CONDUCT ON SITE

A. The Contractor and his personnel shall not interact with any of the facility users. The Contractor shall set up, in accordance with the Temporary Facilities, toilet facilities for all personnel involved in the project. No tradesperson, supplier, truck driver shall use the toilet facilities of the school or community center at any time during the completion of this work. Any person violating this provision of the contract will be removed from the site.

1.16 REQUIRED PROCEDURES

A. Schedule of Values shall be provided by the Contractor for each individual school building. The Schedule of Values shall be formatted to meet the standard MSBA Schedule of Values format with categories of work assigned to standardized work category designations. The preliminary Schedule of Values shall be approved by the Architect and OPM prior to the submission of the first payment application.

B. The contractor shall submit individual Applications for Payments for each individual school building. The Payment Application shall be approved by the Architect and OPM prior to the submission of the payment requisition.

C. The Contractor hereby agrees and acknowledges that the Contractor's records relating to the Project shall be subject to audit by the City / Agent, and such records shall include, but not be

limited to, to the extent applicable, accounting records, written policies and procedures, Subcontractor files (including proposals of successful and unsuccessful bidders, bid tabulations, etc.), original estimates, estimate worksheets, correspondence, change order files, backcharge logs and supporting information, general ledger entries detailing cash and trade discounts earned, insurance rebates and dividends and any other Contractor records that may have a bearing on matters of interest to the City / Agent in connection with the Contractor's work for the Owner.

1.17 COMMISSIONING

A. The City will provide the services of a commissioning agent to perform tests and inspections of installed building elements and systems to validate installation and performance of the Work as intended and required by the Contract Documents. These tests and inspections may be performed by the Owner's Representative or by independent contractors or consultants, and the Contractor shall cooperate as necessary to permit the performance of the tests and inspections and shall perform all corrections as noted by the Commissioning Agent. The Commissioning Agent of the Owner or the Authority will utilize information provided by the Contractor for installation conditions. The commissioning activity performed by the Owner or the Authority in no way relieves or replaces the obligations of the Contractor in fulfilment of contract obligations. Any commissioning activities are at the sole discretion of the Owner or Authority and are not a requirement of this agreement.

B. Failed tests or inspections requiring retesting and additional site visits by the Commissioning Agent will be paid for by the Contractor until tests and inspections provide results that are in accordance with the specified requirements.

1.18 ROOF AND GROUND PROTECTION

A. All ground and roof areas which may be affected by the Work procedures to be photo and video documented by the General Contractor prior to commencement of the Work.

B. Roof Protection - Where work requires Contractor's forces and equipment to access rooftop areas, the Contractor shall protect all roof and roof edge areas from damage. The contractor will provide minimum ¾" thick plywood over rooftop work areas and all roof areas requiring foot traffic, staging or other equipment that could damage the roofing. The plywood cover shall be placed continuously over rooftop work areas to a minimum 12 feet from exterior walls to receive windows and pathways to access work areas. Additional plywood covering may be required to provide foot traffic space around staging. All foot traffic pathways to be a minimum 8 feet in width. The Contractor will be responsible for immediate repairs to damaged roof areas and shall report all damages immediately upon occurrence.

C. Ground Protection – Where staging, lifts, cranes, vehicle access, etc. damage the lawns, shrubs, playground and/or equipment, trees, gravel or paved ground surfaces on the school building site, the General Contractor will be responsible for the restoration of the damaged elements to new condition. Contractor should review site plans provided with Bid Documents to familiarize themselves with site conditions around each school. Playgrounds with rubber surfaces should be protected from damage from construction activities.

1.19 PARKING, STORAGE AND DELIVERY OF MATERIALS

*A. Onsite storage and parking is limited. Refer to Site Logistics plan. Contractor to work with **Newton Public Schools** to coordinate use of dumpsters and deliveries to site.*

1.20 CORI CHECKS

A. The Contractor shall submit certification that they are in conformance with the standards as set forth by the **City of Newton**, regarding CORI checks policy for all workers on the project. All workers to complete and submit CORI Request Form.

1.21 RECORD EXISTING CONDITIONS

A. At the completion of construction, the Contractor shall take post construction photographs of all areas where pre-existing damaged has been recorded as part of the Pre-Construction Survey. These photographs shall be submitted to the Architect and organized and annotated describing the type of pre-existing damage and its location and any changes that have occurred during the construction period.

1.22 PERMITS AND REGULATIONS

A. The Contractor shall be responsible for all permits and permit fees necessary to complete the construction work. All fees for permits shall be included in the Contractors bid.

1.23 NOT USED

1.26 NOT USED

01 35 00 END OF SPECIAL PROJECT PROCEDURES

SECTION 01 35 43

ENVIRONMENTAL PROCEDURES

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

B. Examine all other Sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.2 RELATED WORK UNDER OTHER SECTIONS

A. Section 02 83 33 Demolition of Material Bearing Lead Paint

B. Section 06 10 00 Rough Carpentry

C. Section 07 53 23 Roofing (Adhered EPDM Roofing System)

D. Section 22 00 01 Plumbing

E. Section 23 00 00 Heating Ventilation and Air Conditioning

F. Section 26 00 01 Electrical

1.3 HAZARDOUS MATERIALS PROCEDURE

A. Asbestos:

1. If Hidden ACM may is found during demolition. Refer to items 2 and 3 below.
2. Unknown and inaccessible ACM: During demolition, it is possible that previously unknown asbestos materials may be discovered in currently concealed locations.
3. Notification: If the General Contractor or Sub-Contractors discover or encounter any ACM during the performance of the work, the General Contractor shall immediately:
   a. Stop work, notify the Architect and OPM about the presence of suspect ACM and request instructions for proper action, and
   b. Take whatever steps and measures are necessary to reduce, control or eliminate the risk of exposure of workers and the public to the ACM.
   c. Every effort will be made to obtain the 10-day DEP waivers to remove hidden or unforeseen ACM by the asbestos contractor. The General Contractor or Sub-Contractor shall allow sufficient time for the removal of the ACM at no additional charges to the owner for delays and should waivers be denied.
4. Responsible Person On-Site: The General Contractor shall designate one of its senior on-site employees to be in charge of coordination between the HAZ MAT Consultant, Architect, and all Sub-Contractors with respect to hazardous materials issues.
5. Responsibility for Hazardous Material Discovery: It is the sole responsibility of the General Contractor and Sub-Contractors to undertake whatever measures, methods or procedures

are necessary, required or otherwise appropriate to safeguard the health and safety of all workers and members of the public with respect to identification and discovery of previously unknown hazardous materials during the work of the Project.

6. Roofing material has been tested. Materials tested show no ACM detected .
7. Indemnification: To the fullest extent permitted by law, the General Contractor and Sub-Contractors shall indemnify and hold harmless the Owner and the Architect and their agents and employees from and against all claims, damages, losses and expenses including, but not limited to, attorneys' fees arising out of or relating to the performance of the Work, including the discovery or identification of any hazardous materials, provided that any such claim, damage, loss or expense if attributable to bodily injury, sickness, disease or death, or to damage to or destruction of tangible property (other than the Work itself) including the loss of use resulting therefrom; and is caused in whole or in part by any negligent act or omission of the General Contractor and Sub-Contractors, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

D. Silica Dust:

1. The General Contractor and Sub-Contractors shall be made aware that building materials (Material) may contain Silica.
2. Due to the difficulty associated with exhaustive testing, the Owner has elected to direct the General Contractor and Sub-Contractors to assume that Silica was found.
3. The General Contractor and Sub-Contractors shall review and comply with most recent US Department of Labor Final Rule and shall take extra precautions to protect workers and other personnel on site.

PART 2 – PRODUCTS Not Used

PART 3 – EXECUTION Not Used

END OF SECTION

Asbestos Identification Laboratory.

165 New Boston St., Ste 227
Woburn, MA 01801
781-932-9600

Web: www.asbestosidentificationlab.com Email: mikemanning@asbestosidentificationlab.com

NVLAP® Testing Lab Code: 200919-0

Batch: 114434

Ammar Dieb
Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702

Project Information

Mason Rice Elementary School, Newton MA

Method: BULK PLM ANALYSIS, EPA/600/R-93/116

Dear Ammar Dieb,

Asbestos Identification Laboratory has completed the analysis of the samples from your office for the above referenced project. The Analysis Method is BULK PLM ANALYSIS, EPA/600/R-93/116The information and analysis contained in this report have been generated using the EPA /600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials. Materials or products that contain more than 1% of any kind or combination of asbestos are considered an asbestos containing building material as determined by the EPA. This Polarized Light Microscope (PLM) technique may be performed either by visual estimation or point counting. Point counting provides a determination of the area percentage of asbestos in a sample. If the asbestos is estimated to be less than 10% by visual estimation of friable material, the determination may be repeated using the point counting technique. The results of the point counting supersede visual PLM results. Results in this report only relate to the items tested. This report may not be used by the customer to claim product endorsement by NVLAP or any other U.S. Government Agency.
Laboratory results represent the analysis of samples as submitted by the customer. Information regarding sample location, description, area, volume, etc., was provided by the customer. Information provided by the customer can affect the validity of results. Asbestos Identification Laboratory is not responsible for sample collection activities or analytical method limitations. Unless notified in writing to return samples, Asbestos Identification Laboratory discards customer samples after 30 days. Samples containing subsamples or layers will be analyzed separately when applicable. Reports are kept at Asbestos Identification Laboratory for three years. All customer information will be maintained in confidentiality. This report shall not be reproduced, except in full, without the written consent of Asbestos Identification Laboratory.

- NVLAP Lab Code: 200919-0
- Massachusetts Certification License: AA000208
- State of Connecticut, Department of Public Health Approved Environmental Laboratory Registration Number: PH-0142
- State of Maine, Department of Environmental Protection Asbestos Analytical Laboratory License Number: LB-0078(Bulk) LA-0087(Air)
- State of Rhode Island and Providence Plantations. Department of Health Certification: AAL-121
- State of Vermont, Department of Health Environmental Health License AL934461

Thank you Ammar Dieb for your business.

Michael Manning
Owner/Director

Ammar Dieb
Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702

Project Information

Mason Rice Elementary School, Newton MA

Method: BULK PLM ANALYSIS, EPA/600/R-93/116

FieldID / LabID	Material	Location	Color	Non-Asbestos %	Asbestos %
1 / 1259877	Glue	under Rubber Roof A	multi	Non-Fibrous 100	None Detected
2 / 1259878	Foam Insulation	under Rubber Roof A	yellow	Non-Fibrous 100	None Detected
3 / 1259879	Paper	under Foam Insulation Roof A	blue	Fiberglass 10 Cellulose 80 Non-Fibrous 10	None Detected
4 / 1259880	Glue	under Rubber Roof A	yellow	Non-Fibrous 100	None Detected
5 / 1259881	Foam	under Rubber Roof A	yellow	Non-Fibrous 100	None Detected
6 / 1259882	Paper	under Rubber Insulation Roof A	black	Fiberglass 10 Cellulose 80 Non-Fibrous 10	None Detected
7 / 1259883	Glue	under Rubber Roof C1	yellow	Non-Fibrous 100	None Detected
8 / 1259884	Foam Insulation	under Rubber Roof C1	yellow	Non-Fibrous 100	None Detected
9 / 1259885	Foam Insulation	under Rubber Roof C1	yellow	Non-Fibrous 100	None Detected
10 / 1259886	Foam Insulation	under Metal Edge Roof A	yellow	Non-Fibrous 100	None Detected
11 / 1259887	Fiber Board	under Fiber Board Insulation under Metal Edge Roof A	brown	Cellulose 90 Non-Fibrous 10	None Detected
12 / 1259888	Tectum Roof Decking	under Fiber Board Insulation Metal Edge Roof A	brown	Cellulose 80 Non-Fibrous 20	None Detected
13 / 1259889	Tar	under Tectum Roof A	black	Non-Fibrous 100	None Detected
14 / 1259890	Tar	under Tectum Roof A	black	Non-Fibrous 100	None Detected
15 / 1259891	Glue	under Rubber Roof E	yellow	Non-Fibrous 100	None Detected
16 / 1259892	Foam Insulation	under Rubber Roof E	yellow	Non-Fibrous 100	None Detected

Sampled: March 29, 2024 **Received:** April 01, 2024 **Analyzed:** April 01, 2024

Tuesday 02 April 2024

Analyzed by: Michael Manning **Batch:** 114434

Ammar Dieb
Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702

Project Information

Mason Rice Elementary School,
Newton MA

Method: BULK PLM ANALYSIS,
EPA/600/R-93/116

FieldID / LabID	Material	Location	Color	Non-Asbestos %	Asbestos %
17 / 1259893	Tectum Roof Decking	under Foam Insulation Roof E	brown	Cellulose 75 Non-Fibrous 25	None Detected
18 / 1259894	Glue	under Rubber Roof E	yellow	Non-Fibrous 100	None Detected
19 / 1259895	Foam Insulation	under Rubber Roof E	yellow	Non-Fibrous 100	None Detected
20 / 1259896	Glue	under Rubber Roof D	yellow	Non-Fibrous 100	None Detected
21 / 1259897	Foam Insulation	under Rubber Roof D	yellow	Non-Fibrous 100	None Detected
22 / 1259898	Tar	under Foam Insulation Roof D	black	Non-Fibrous 100	None Detected
23 / 1259899	Glue	under Rubber Roof D	yellow	Non-Fibrous 100	None Detected
24 / 1259900	Foam Insulatiojn	under Rubber Roof D	yellow	Non-Fibrous 100	None Detected
25 / 1259901	Tar	under Foam Insulation Roof D	black	Non-Fibrous 100	None Detected
26 / 1259902	Glue	under Rubber Roof B	yellow	Non-Fibrous 100	None Detected
27 / 1259903	Foam Insulation	under Rubber Roof B	yellow	Non-Fibrous 100	None Detected
28 / 1259904	Tar	under Foam Insulation Roof B	black	Non-Fibrous 100	None Detected
29 / 1259905	Glue	under Rubber Roof B	yellow	Non-Fibrous 100	None Detected
30 / 1259906	Foam Insulation	under Rubber Roof B	yellow	Non-Fibrous 100	None Detected
31 / 1259907	Tar	under Foam Insulation Roof B	black	Non-Fibrous 100	None Detected
32 / 1259908	Glue	under Rubber Roof B	yellow	Non-Fibrous 100	None Detected
33 / 1259909	Foam Insulation	under Rubber Roof B	yellow	Non-Fibrous 100	None Detected

Sampled: March 29, 2024 **Received:** April 01, 2024 **Analyzed:** April 01, 2024

Tuesday 02 April 2024

Analyzed by: Michael Manning

Batch: 114434

Ammar Dieb
Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702

Project Information

Mason Rice Elementary School,
Newton MA

Method: BULK PLM ANALYSIS,
EPA/600/R-93/116

FieldID / LabID	Material	Location	Color	Non-Asbestos %	Asbestos %
34 / 1259910	Tar	under Foam Insulation Roof B	black	Non-Fibrous 100	None Detected
35 / 1259911	Glue	under Rubber Roof G	yellow	Non-Fibrous 100	None Detected
36 / 1259912	Foam Insulation	under Rubber Roof G	yellow	Non-Fibrous 100	None Detected
37 / 1259913	Glue	under Rubber Roof G	yellow	Non-Fibrous 100	None Detected
38 / 1259914	Foam Insulation	under Rubber Roof G	yellow	Non-Fibrous 100	None Detected
39 / 1259915	Transite Panel	Exterior Walls at Roof G	gray	Cellulose 25 Non-Fibrous 75	None Detected
40 / 1259916	Transite Panel	Exterior Walls at Roof G	gray	Cellulose 25 Non-Fibrous 75	None Detected
41 / 1259917	Caulking	on Wall Joint Roof A - G	black	Non-Fibrous 100	None Detected
42 / 1259918	Caulking	on Wall Joint Roof A - G	black	Non-Fibrous 100	None Detected
43 / 1259919	Caulking	Around Chimney on Roof	multi	Non-Fibrous 100	None Detected
44 / 1259920	Caulking	Around Chimney on Roof	multi	Non-Fibrous 100	None Detected
45 / 1259921	Caulking	Around Chimney on Roof	multi	Non-Fibrous 100	None Detected

Sampled: March 29, 2024 **Received:** April 01, 2024 **Analyzed:** April 01, 2024

Tuesday 02 April 2024

Analyzed by: Michael Manning

Batch: 114434

CHAIN OF CUSTODY

Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702
Tel: (508) 628-5486 - Fax: (508) 628-5488
adieb@uec-env.com

Next Day results

Town/City: Nawion MA Building Name Mason Rice Elementary Scho

Sample #	Description of Material	Sample Location
1	Glue	under ruber roof A
2	foam insulation	under ruber roof A
3	Paper	under foam insulation roof A
4	Glue	under ruber roof A
5	foam	under ruber roof A
6	Paper	under foam insulation Roof A
7	Glue	under ruber roof C1
8	foam insulation	under Ruber roof C1
9	foam insulation	under Ruber roof C1
10	foam insulation	under Metal edge Roof A
11	fiber Board	under foam insulation under Metal edge roof A
12	Tectum roof decking	under fiber board insulation Maial edge roof A
13	Tar	under Tectum roof A
14	Tar	under Tectum roof A
15	Glue	under Ruber roof. E
16	foam insulation	under Ruber roof E
17	Tectum roof decking	under foam insulation Roof E
18	Glue	under Ruber roof E
19	foam insulation	under Ruber roof E
20	Glue	under Ruber roof D

Reported By: Erick Estrada Date: 3-29-24 Due Date: .....

Received By: Date: 4-1-24

CHAIN OF CUSTODY

Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702
Tel: (508) 628-5486 - Fax: (508) 628-5488
adieb@uec-env.com

Town/City: Newton MA Building Name Mason Rice Elementary School

Sample #	Description of Material	Sample Location
21	Foam insulation	under Ruber roof D
22	Tar	under foam insulation Roof D
23	Glue	under ruber roof D
24	foam insulation	under Ruber roof D
25	Tar	under foam insulation roof D
26	Glue	under Ruber roof B
27	foam insulation	under Ruber roof B
28	Tar	under foam insulation Roof B
29	Glue	under Ruber roof B
30	foam insulation	under Ruber roof B
31	Tar	under foam insulation Roof B
32	Glue	under Ruber roof B
33	foam insulation	under Ruber roof B
34	Tar	under foam insulation Roof B
35	Glue	under Ruber roof E
36	foam insulation	under Ruber roof E
37	Glue	under Ruber roof E
38	foam insulation	under Ruber roof E
39	Transite Panel	Exterior walls at roof E
40	Transite Panel	Exterior walls at roof E

Reported By: Erick Estrada Date: 3-29-14 Due Date: ----------

Received By: ---------- Date: ----------

CHAIN OF CUSTODY

Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702
Tel: (508) 628-5486 - Fax: (508) 628-5488
adieb@uec-env.com

Town/City: Newton MA Building Name Mason Rice elementary School

Sample #	Description of Material	Sample Location
41	Caulking	on wall Joint Roof A-B
42	Caulking	on wall Joint Roof A-B
43	Caulking	Around Chimney roof
44	Caulking	Around Chimney roof
45	Caulking	Around Chimney on roof

Reported By: Erica Estrada Date: 3-19-24 Due Date: .....

Received By: ..... Date: .....

SECTION 01 39 90

MINOR ALTERATION WORK

PART 1 - GENERAL

1.01 General Conditions, Supplementary Conditions and applicable parts of Division 1 form a part of this Specification and the Contractor shall consult them in detail for instructions.

1.02 The Drawings on which this Contract is based are listed in Section 00 86 00. Consult all Drawings, note all conditions that may affect the Work and care for same in executing the Contract.

1.03 Under this Section, the work shall provide all materials, labor, equipment and appliances required to do patching, repair and alterations caused by damages in the progression of work not otherwise specified as indicated or required or both to complete the Work under this Contract.

1.04 Under this section, shall provide all materials, labor and equipment required to provide both exterior and interior protection and cleaning, including but not **limited to all interior rooms in conjunction where work occurs above on the roof with poly barrier membrane covering over all surfaces / furniture / electronic devices prior to commencement of work.** This contractor shall maintain protection during all construction activities and provide periodic cleanings and a final cleaning to all affected areas. This shall include all interior and exterior areas in and adjacent to the work being performed on the building structure and site. List below is a general description of the work to be performed, but is not limited to the following.

1. Patch, repair and paint of existing GWB / Plaster ceilings and walls where new renovations have occurred.
2. Patch and repair of existing suspended ceilings where new renovations and access has occurred.
3. **Repair of landscaped and lawn areas where damage has occurred for access to building, windows, doors, roof and site.**

A. Application of Requirements: Requirements specified in this Section apply to alteration work throughout the Work whether specified in this or other Sections.

1.05 Related Sections

A. All sections in Divisions 1 through 33

B. Refer to other Sections for specific requirements for removal, alteration and reuse of existing materials and items not specified in this Section.

1.06 Submittals

A. This Contractor shall submit Shop Drawings and related data samples for the Architect's approval in accordance with Section 01 33 00.

1. When Work specified in this Section is required, submit descriptions of methods to be used. Include manufacturer's data fully describing each material and product and certificates certifying compliance with Contract Documents. Show Drawings showing details of conditions to be encountered and narrative descriptions, including industry standards detailing methods proposed for making repairs. Provide such data, Shop Drawings and descriptions whether or not materials and methods to be used are indicated in the Contract Documents.

a. Manufacturer's Data: Include a product description of each material and product proposed for use, including but not be necessarily limited to the following:

1) Sod: Include seed formula and location of source

2) Fertilizer and lime

3) Materials for Concrete Repair: Include product data and instructions for proprietary products to be used as materials for concrete repairs, including bonding agents, hardeners, admixtures, curing materials, etc.

4) Acoustical ceilings

5) Other products specified in this Section

b. Certificates: Certification data and certificates substantiating that plants to be used as replacement for plants damaged during the Work exactly match those removed in every particular and have been certified by authorities having jurisdiction.

c. Shop Drawings: Include details of each condition to be encountered, including but not be necessarily limited to installation and anchoring details and relationship to other work of each material and item requiring installation or reinstallation at each condition.

d. Narrative descriptions shall include, but not be necessarily limited to, the following:

1) Methods to be used to protect existing vegetation, paving, building walls, cabinetwork, casework, materials, equipment, accessories, and finishes to be left in place while the Work is in progress

2) Methods to be used to prepare existing surfaces for repairs

3) Methods proposed for sodding and planting new plants to replace those removed because of damage. Methods submitted shall be as recommended by the specialist firm charged with planting and sodding.

4) Methods proposed for cleaning and repairing acoustical ceiling and support system damaged or soiled during the work under this Contract

e. Samples: When requested, submit for approval samples of materials and items proposed for use in making repairs and renovations. This requirement does not supersede submittal requirements specified in other Sections.

f. Alterations Schedule: Before doing any Work at the site, submit for approval a schedule showing alterations required under the Contract. Coordinate alterations schedule with phasing schedule specified in Section "Work Sequence" and demolition schedule specified in Section "Demolition Schedule specified in Section "Demolition." Incorporate approved alterations schedule into construction schedule specified in Section "Submittals."

1.07 Quality Assurance

A. General: Test materials to be used in making repairs for compatibility with existing materials. Do not proceed with repairs until Architect approves tests. Do not use incompatible materials.

B. Plants and Sod: Planting and maintenance of plants and sod shall be done by an accepted single firm which specializes in such work.

C. Concrete: In making concrete repairs, comply with applicable requirements of ACI 301. "Specifications for Structural Concrete Buildings" ACI 318. "Building and Code Requirements for Reinforced Concrete" and the CRSI "Manual of Standard Practice."

D. Acoustical Ceilings: Have reinstallation done by an experienced installer of such systems.

E. Fire Performance Characteristics: Where fire-resistance ratings are indicated or required in existing work, provide materials and construction identical to those of assemblies whose fire endurance has been determined by testing in compliance with ASTM E119 by a recognized testing and inspecting organization or by another means as acceptable to the authority having jurisdiction.

1.08 Delivery, Storage and Handling

A. Latex Cement Underlayment: Deliver in unopened factory containers with manufacturer's labels intact. Store in dry areas at temperatures above 40 degrees F. Use caution when mixing and applying to prevent irritation to worker's skin or eyes.

B. Other Cementitious Products: Deliver in manufacturer's original packages showing brand names. Store materials in unopened containers in a dry place.

C. Metal Products: Store 18 inches above ground and cover to prevent rusting and contact with soil or other materials that would destroy or reduce bond or otherwise damage the products. Do not create humid chambers under coverings.

D. Use no damaged or defective materials.

E. Do not stack materials to exceed design live loads of structure.

1.09 Project Conditions

A. Disconnecting Services: Notify Owner and authorities owning or controlling wires, conduits, pipes, and other services affected by renovation and repair before starting operations. Refer to General Conditions and other specification sections for additional requirements related to existing utilities and services.

B. Protecting Property to Remain: Protection requirements specified in Section "Demolition" also apply to repair and alterations work. Protect from staining and other harm, vegetation, paving, finished surfaces, casework, cabinetwork, equipment, accessories, and devices that remain in place while the Work is being done. When removing items and surfaces to remain in order to do the Work protect removed items and materials from damage and staining. Satisfactorily repair damage done during the Work. Satisfactorily remove stains without damage to the stained surface. Remove and discard items with stains that cannot be satisfactorily removed and provide new matching items at no additional cost. Also remove damaged items that cannot be satisfactorily repaired and provide new matching items, at no additional cost.

C. Movement, Settlement and Other Damage to Existing Building Due to Alterations Work: Be solely responsible for correct damage resulting from inadequate, improper or careless construction procedures or inadequate shoring, bracing, support or protection.

D. Differing Conditions: Should materials, systems or conditions be encountered that differ from those indicated, immediately notify Architect by Telephone, followed by letter, and do not proceed without instructions.

E. Examine Existing conditions. Examine surfaces to receive alterations Work and conditions under which the Work will be done. Do not proceed with the Work specified in this section before correcting unsatisfactory conditions.

PART 2 - PRODUCTS

2.01 Salvaged Materials and Items

A. To the extent indicated, reuse materials and items so indicated.

B. Materials and Items to be Reused: Reinstall materials and items shown to be removed and reinstalled or which Contractor removes to make a way to do the Work in the same location

from which removed unless indicated otherwise. Materials to be salvaged and reused in the Work include, but are not necessarily limited to, brick, concrete masonry units, acoustical ceilings, ceiling light fixtures, certain mechanical, electrical, plumbing and drainage equipment and devices and other materials and items indicated to be removed and reinstalled. Materials and items to be salvaged and reused in the Work also include items and materials similar to those listed above that must be removed in order to accomplish the Work but that are not specifically shown or specified to be removed, if Architect approves reinstallation.

C. Materials and Items Not to be Reused: Do not reuse in the Project materials and items removed from the existing building to make way for the Work except as otherwise noted or with written approval unless removed material or item is indicated to be reused or unless the Contract Documents permit reuse at Contractor's option.

D. Preparing for Reuse: Clean salvaged materials and items that will be reinstalled. Clean mortar from masonry units by hand. Put operating items in proper working order. Reused materials shall be in good condition without objectionable chips, cracks, splits, checks, dents, scratches, or other defects. Operating items shall operate properly.

2.02 New Materials

A. General

1. Provide new materials to match existing for closing of openings, repairs and reconstructions where suitable salvaged materials do not exist where insufficient quantities of salvaged materials exist to complete the Work or where reuse is not permitted. New materials to match existing shall be same types, sizes, qualities and colors as existing adjacent materials.

2. Required new materials where similar materials do not exist shall comply with requirements specified in other Specification Sections.

B. Trees, Shrubs, Ground Covers and other Plants: Comply with recommendations of ANSI Z60.l, "American Standard for Nursery Stock." Exactly match removed plant in condition that existed before the damage.

C. Sod: Exactly match existing grass in type and seed mix; certified by state from which purchased; approved.

D. Fertilizer, Lime and Other Soil Amendments and Topsoil and Planting Soil Mix: In accordance with recommendations of specialist firm who will plant and sod and approved.

E. Materials for Concrete Repairs:

1. Concrete: ASTM C94; 3,000 psi.

2. Bonding agent: Two component epoxy-resin grout; ASTM C881; Type I or II

3. Curing materials: Impervious sheet of white opaque 4-mil-thick polyethylene, waterproof craft paper, or polyethylene-coated burlap

4. Other concrete materials: As approved.

F. Acoustical Ceilings: Use existing suspension systems and acoustical materials. Should existing materials be damaged beyond satisfactory repair, use new products that exactly match those existing.

G. Other New Materials to Match Existing: Same types, sizes, qualities, and colors as existing adjacent materials for closing of openings and repairs where suitable salvaged materials do not exist or where insufficient quantities of salvaged materials exist to complete the Work required, or where reuse of removed materials is not permitted.

H. Required new materials where similar materials do not exist shall comply with requirements specified in other Specification Sections.

PART 3 - EXECUTION

3.01 Alterations, Patching and Repairs

A. General: General repair of existing materials including but not limited topaving, landscaping, lawns, concrete, flooring, painted walls and acoustical ceilings is required where damage has occurred during the progression of work. Where cutting, alteration, removal or repair of such existing materials is indicated as part of the Work, or is necessary to permit performing the Work, and where existing materials are damaged during the Work, patch and repair using specified products. Finish to match existing adjacent work. Patches and repairs shall not be discernible from normal viewing distance.

B. Removal and Storage Requirements: General requirements for removal are specified in Section 02 41 19 Selective Demolition. Removal of some materials and items is specified in other Specification Sections. Store materials and items to be reused in a safe location until reinstalled and assume responsibility for safe storage and handling.

C. Repair of Materials and Items to be Reused: Satisfactorily repair materials and items to be reused that have become damaged during Contractor's operations or provide new equal products at no additional cost. Provide missing parts necessary to complete each installation.

D. Patching Coordination: Coordinate patching involving various trades whether or not specifically mentioned in the Contract Documents.

E. Restoring Existing Finishes:

1. Restore floor, wall and ceiling finishes damaged or defaced because of cutting, patching, demolition, alteration, renovation or repair work to condition equal to that before Work under this Contract started.

2. Where alteration, repair, or removals expose damaged or unfinished surfaces or materials, repair and finish or refinish such surfaces or remove the damaged or unfinished surfaces or materials and provide new, acceptable, matching surfaces or materials or acceptable salvaged materials to make continuous areas and surfaces uniform.

F. Standards: Perform new Work and restore and refinish existing Work to comply with applicable requirements of the Specifications, except as follows:

1. Materials for use in repair of existing surfaces but not otherwise specified shall conform to the highest standards of the trade involved and be in accordance with approved industry standards as required to match the existing surface.

2. Workmanship for repair of existing materials not otherwise specified shall conform to similar workmanship existing in or adjacent to space where alterations are to be made.

3. Reinstall salvaged items where no similar items exist in accordance with the highest standards of trade involved and in accordance with approved Shop Drawings.

G. Patching Holes: Properly close and patch holes and openings in existing roof deck, floor, wall and ceiling surfaces resulting from alteration work and those shown to be filled to match adjacent undisturbed surfaces.

H. Repairing Damaged Paving and Curbs:

1. Similarly rectify damage to pavement, curb and gutter, or other structure incurred as a result of the Work.

I. Existing Courtyard walks and Surfaces: Protect Repair damage to condition equal to that existing before the damage.

J. Removed or Abandoned Utilities: Cap, valve, plug or bypass to make a complete and working installation.

K. Landscaping and Lawns: Protect existing lawns and plantings to remain.

L. Turf: Where existing turf is damaged during the Work, remove damaged turf and provide new sod. Place sod in accordance with approved narrative description of methods to be used, using approved sod, fertilizer, lime, and related materials and during normal planting season, as approved. Sod is subject to approval in place. Maintain sod until approved. Promptly remove rejected sod and provide new acceptable sod.

M. Concrete Repairs:

1. Where existing concrete is cut, drilled or otherwise damaged during the Work, patch and repair using 3,000 psi concrete. Follow approved narrative description of methods to be used. Bond new concrete to old concrete using specified epoxy-resin grout. Properly cure new concrete and finish to match existing adjacent concrete in color and texture.

2. Where removing existing curbs, bases, walls, partitions, equipment, cabinetwork, finishes or topping leaves floor surface rough, depressed or unlevel, patch and level to within 1/8 inch in each 6 feet, leaving a finish resembling that left by steel trowel finishing; use a combination of concrete topping specified in Section "Cast-In-Place Concrete" and latex cement underlayment. Tolerance applies not only within the area of removal but also between the area of removal and adjacent surfaces.

   a. Mixing latex cement underlayment: Follow manufacturer's instructions. Pour liquid into powder and mix thoroughly to proper consistency for Work to be done. Use material within one hour of mixing. If mix is too stiff, a small quantity of liquid latex may be added to aid workability.

   b. Preparation: Clean surfaces of dust, dirt, oil, grease, paint, and other foreign matter. Concrete shall be thoroughly cured, and free from curing compounds. If concrete is very dry, dampen slightly with water before spreading underlayment. Do not permit water to puddle. Brush surfaces to receive underlayment with a prime coat of same latex used in underlayment mix and allow to dry clear before spreading underlayment.

   c. Installation: Follow manufacturer's instructions. Build up thicknesses more than 1/4 inch using multiple coats, each not more than /14 inch thick. Do not install where more than one inch in finished thickness.

N. Reinstalling Acoustical Ceilings:

1. After completing Work above acoustical ceilings, examine hangers and hanger attachments that have been left in place. Verify their adequacy and suitability as support for reinstalled ceiling. Remove rejected hangers and attachments and provide new acceptable ones. Obtain approval before proceeding.

2. After approval of hangers and attachments, reinstall the existing lay-in grid and acoustical materials in the same locations from which they were removed. Do not reinstall removed acoustical ceilings in locations other than those from where removed.

3. Repair minor damage to removed acoustical ceiling components using approved methods. Should existing acoustical ceiling components become damaged beyond satisfactory repair, or should Architect reject repairs, remove such damaged components and provide new, matching, acceptable components.

4. Leave ceilings complete with no voids or openings, in the same plane as previously installed, with joints aligned, level to within 1/8 inch in 12 feet, and in every way the equal of the ceilings before removal.

5. Clean soiled reinstalled acoustical ceilings using approved methods. Remove permanently soiled or stained units and provide new matching units.

O. Existing Pipe and Duct covering and Existing Sprayed-on Firestopping: Restore to their original undamaged conditions.

P. Mechanical and Electrical Equipment and Devices:

1. Reinstall and properly reconnect existing light fixtures; lighting panels; switches; outlets, thermostats, and other existing mechanical, electrical, and plumbing equipment and devices removed during the Work but not indicated to be removed. Reinstall only equipment and devices that are in good condition. Discard equipment and devices that are not in condition at least as good as existed before removal and provide new equivalent equipment and devices. New equipment and devices shall exactly match those removed in type, size, finish, configuration, and operating characteristics.

END OF SECTION

SECTION 01 41 17

UTILITIES NOTIFICATION

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

A. Comply with all regulations and laws concerning excavation, demolition, or explosive work and be advised of utility notification requirements under Chapter 82, Section 40 of the Massachusetts General Laws.

1.2 ADMINISTRATIVE AUTHORITY

A. Notification of utilities within the Commonwealth is performed through the Utilities Underground Plant Damage Prevention System, commonly referred to as “Dig Safe”.

1.3 REGULATORY REQUIREMENTS

A. Contractors must notify “Dig Safe” by telephone before performing any earth moving operations including: digging, trenching, boring, site demolition, excavation, backfilling, grading, or explosive work in all public ways and private property.

B. This notification must be made at least 72 hours (excluding weekends and holidays) prior to the Work described above, but not more than 30 calendar days before commencement of the contemplated Work. Notification shall occur between 6:00 AM to 6:00 PM local time from Monday to Friday, except in cases of emergency.

1. The toll free phone number is: **811**.
2. Provide the following information:
    a. Municipality.
    b. Location of work.
    c. Intersecting street.
    d. Type of work.
    e. Starting date and time of work.
    f. Name and title of caller.
    g. Phone number of caller.
    h. Best time for “Dig Safe” to return calls.
    i. Company name of General Contractor.
    j. Company name of Subcontractor or Filed Subcontractor performing sub-grade work.

C. Member utilities of the Utilities Underground Plant Damage Prevention System are required to respond to the notice within 72 hours from the time said notice is received by designating at the locus the location of pipes, mains, wires, or conduits.

1. Locations of underground utilities will be marked by spray paint or stakes. Marks will be color coded with additional descriptions of letters and arrows.

D. Do not commence work until “Dig Safe” has been properly notified and has responded as described above.

E. Subsequently notify “Dig Safe” of unanticipated additional blasting required after the initial notification to “Dig Safe” has been made. Do not perform the additional blasting work in less than 4 hours following the subsequent notification.

1.4 PROTECTION

A. The Contractor is fully responsible for protection of the utility location markings, wherever these occur, on or off-site.

B. Perform Work in such a manner, and with reasonable precautions taken to avoid damage to utilities under the surface in said areas of work. Immediately notify any known or suspected damage to underground utilities to the owner of such utilities.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION (not used)

End of Section

SECTION 01 42 00

REFERENCES AND DEFINITIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Abbreviations and Acronyms.

B. Definitions

C. Reference Standards.

1.2 ABBREVIATIONS AND ACRONYMS

A. The following list of common abbreviations are referenced in individual specification sections. This list is provided for convenience to the Contractor and is not intended to define all abbreviations use in the Contract Documents.

1. Abbreviations for contract and specifications.

DCAMM	Massachusetts Division of Capital Asset Management
DOE	Massachusetts Department of Education
EPA	United States Environmental Protection Agency
IAQ	Indoor Air Quality
IEQ	Indoor Environmental Quality
HVAC&R	Heating, ventilating, air conditioning, and refrigeration systems.
LEED™	United States Green Building Council, *Leadership in Energy and Environmental Design Rating System*.
MEPA	Massachusetts Environmental Protection Agency
MGL	Massachusetts General Laws
MHD	Massachusetts Highway Department (Mass Highway)
MSDS	Material Safety Data Sheet
NIC	Not In Contract
OFCI	Owner Furnished, Contractor Installed
OFI	Owner Furnished and Installed
VOC	Volatile Organic Compounds

2. Abbreviations for measurements and quantities.

C	Celsius
cm	Centimeter
F	Fahrenheit
Hrs	Hours
Kg	Kilogram
L	Liter
M	meter
m^2 or SM	square meter
m^3 or CM	cubic meter
mm	Millimeter

Mths	Months
psi	Pounds per square inch
t	ton

3. Abbreviations for Drawings.

A	Acre
AC	Air Conditioning
ACST	Acoustical
ACT	Acoustical Ceiling Tile
AD	Area Drain
ADD	Addendum
ADDL	Additional
ADJ	Adjustable, Adjacent
AFF	Above Finish Floor
AGGR	Aggregate
AHU	Air Handling Unit
ALT	Alternate
ALUM	Aluminum
ANOD	Anodized
AP	Access panel
APRX	Approximate
ARCH	Architectural
AVG	Average
&	And
∠	Angle
@	At
BC	Brick Course
BD	Board
BG	Below Grade
BL	Building Line
BLDG	Building
BLK	Black
BLKG	Blocking
BLR	Boiler
BM	Beam, Bench Mark
BTM	Bottom
BTU	British Thermal Unit
BOW	Bottom of Wall
CAB	Cabinet
CB	Chalkboard
CBN	Catch Basin
CJ	Control Joint
CL	Center Line

CLG	Ceiling
CLKG	Caulking
CLOS	Closet
CLR	Clear
CLSRM	Classroom
CMT	Ceramic Mosaic Tile
CMTB	Ceramic Mosaic Tile Base
CMU	Concrete Masonry Unit
COL	Column
COMP	Compressible
CONC	Concrete
CONST	Construction
CONT	Continuous
CONTR	Contractor
CORA	Corridor
CPT	Carpet
CRS	Course
CT	Ceramic Tile
CTB	Ceramic Tile Base
CTR	Center
CUH	Cabinet Unit Heater
CW	Coldwater
[	Channel
D	Deep
DBL	Double
DEG	Degree
DEMO	Demolition
DEPT	Department
DET	Detail
DF	Drinking Fountain
DIA	Diameter
DIFF	Diffuser
DIM	Dimension
DISP	Dispenser
DIV	Division
DN	Down
DPFG	Damp Proofing
DR	Door
DRW	Drawer
DS	Downspout
DWG	Drawing
E	East
EA	Each

EJ	Expansion Joint
EL	Elevation
ELEC	Electrical
ELEV	Elevator
EMER	Emergency
ENCL	Enclosure
ENTR	Entrance
EP	Electrical Panel, Epoxy Paint
EQ	Equal
EQUP	Equipment
EWC	Electric Water Cooler
EX	Existing
EXCV	Excavation
EXP	Exposed
EXT	Exterior
EXTR	Extruded
FA	Fire Alarm
FAB	Fabricate
FAF	Fluid-Applied Athletic Flooring
FB	Flat Bar
FD	Floor Drain
FDVC	Fire Department Valve Cabinet
FE	Fire Extinguisher
FEC	Fire Extinguisher Cabinet
FEJ	Floor Expansion Joint
FF	Finish Floor
FH	Fire Hydrant
FIN	Finish
FINGR	Finish Grade
FIX	Fixed
FIXT	Fixture
FLASH	Flashing
FLEX	Flexible
FLOUR	Fluorescent
FLR	Floor
FND	Foundation
FPRF	Fire Proofing
FRT	Fire Retardant Treated
FS	Food Service
FT	Foot, Feet
FTG	Footing
FTR	Finned Tube Radiation
FURN	Furniture

FURR	Furring
FUT	Future
GA	Guage
GALV	Galvanized
GC	General Contractor
GEN	General, Generator
GFRG	Glass Fiber Reinforced Gypsum
GFRP	Glass Fiber Reinforced Plaster
GL	Glass
GND	Ground
GWB	Gypsum Wall Board
GYP	Gypsum
H	High
HC	Hollow Core
HDW	Hardware
HM	Hollow Metal
HORZ	Horizontal
HP	High Point
HR	Hour
HT	Height
HVAC	Heating Ventilation & Air Conditioning
HW	Hot Water
HWD	Hardwood
ID	Inside Diameter
IN	Inch, Inches
INCL	Include, Inclusive
INSUL	Insulation, Insulated
INT	Interior
INV	Invert, Inverse
JAN	Janitor
JT	Joint
KD	Knocked Down
KEC	Kitchen Equipment Contractor
KIT	Kitchen
KW	Kilowatt
KWH	Kilowatt Per Hour
L	Left, Long
LAM	Laminate, Laminated
LAV	Lavatory
LB	Pound
LF	Linear Foot, Linear Feet
LH	Left hand
LP	Low Point

LT	Light
LTG	Lighting
MAT	Entrance Mats, Entrance Grate
MATL	Material
MAX	Maximum
MB	Marker Board
MECH	Mechanical
MEMB	Membrane
MFR	Manufacturer
MIN	Minimum
MISC	Miscellaneous
MO	Masonry Opening
MR	Moisture Resistant
MTD	Mounted
MTG	Mounting, Meeting
MTL	Metal
MUL	Mullion
N	North
NAT	Natural
NIC	Not In Contract
NO	Number
NOM	Nominal
NRC	Noise Reduction Coefficient
NTS	Not To Scale
OA	Overall
OC	On Center
OD	Outside Diameter
OFI	Owner Furnished Item
OFCI	Owner Furnished /Contractor Installed
OH	Overhead
OPER	Operable
OPNG	Opening
OPP	Opposite
OZ	Ounce
P	Paint
PAR	Parallel
PERF	Perforated
PERP	Perpendicular
PG	Paint Grade
PL	Plate
PLAM	Plastic Laminate
PLBG	Plumbing
PLAS	Plaster

PNL	Panel, Paneling
POL	Polished
PPT	Porcelain Paver Tile
PPTB	Porcelain Paver Tile Base
PR	Pair
PRFB	Prefabricated
PRTBD	Particle Board
PSI	Pounds Per Square Inch
PT	Pressure Treated
PTD	Painted
PTN	Partition
PWD	Plywood
QR	Quarter Round
QT	Quarry Tile
QUAL	Quality
QUAN	Quantity
R	Radius, Riser, Rubber
RB	Rubber Base
RCPT	Receptacle
RD	Roof Drain
REC	Recessed
RECT	Rectangular
REF	Reference
REFL	Reflected
REFR	Refrigerator
REINF	Reinforced
REQD	Required
RESIL	Resilient
REV	Revise, Reverse
RH	Right Hand
RHR	Right Hand Reverse
RL	Rain Leader
RLG	Railing
RO	Rough Opening
RR	Rubber Riser
RIT	Right
RTR	Rubber Tile, Rubber Tread
S	South
SC	Solid Core
SCHD	Schedule
SCRF	Static.Control Resilient Flooring
SECT	Section
SEG	Segment

SF	Square Foot
SH	Shelf
SHT	Sheet
SHR	Shower
SHVT	Seamless Sheet Vinyl
SIM	Similar
SLH	Slotted Horizontal
SLV	Slotted Vertical
SMFL	Seamless Flooring
SPEC	Specification
SQ	Square
SQIN	Square Inch
SS	Stainless Steel
SSM	Solid Surface Material
ST	Street
STA	Station
STC	Sound Transmission Classification
STD	Standard
STL	Steel
STOR	Storage
STR	Structure
STRL	Structural
SUB	Subcontractor
SUSP	Suspended
SWD	Softwood
SYM	Symmetrical
SYN	Synthetic
SYST	System
T	Tread
T&G	Tongue and Groove
TB	Tack Board
TC	Top of Curb
TEL	Telephone
TEMP	Temporary, Temperature
TFE	Thin-Film Epoxy Flooring
THK	Thick
THR	Threshold
TLT	Toilet
TO	Top of
TOB	Top of Blocking
TOC	Top of Concrete
TOF	Top of Foundation / Footing
TOS	Top of Steel

TRK	Track
TS	Tube Steel
TV	Television
TW	Top of Wall
TYP	Typical
TZ	Terrazo
UC	Undercut
UL	Underwriters Laboratory
UNO	Unless Noted Otherwise
UR	Urinal
UV	Unit Ventilator, Ultraviolet
VB	Vinyl Base
VCT	Vinyl composite tile
VERT	Vertical
VEST	Vestibule
VIF	Verify in field
VP	Veneer plaster
VTR	Vent through roof
VWC	Vinyl Wallcovering
W	West, Wide, Width
W/	With
W/O	Without
WAB	Wood Athletic Flooring Vented Base
WAF	Wood Athletic Flooring
WC	Water Closet
WD	Wood
WEJ	Wall Expansion Joint
WF	Wide Flange
WH	Water Heater
WP	Work Point
WPFG	Water Proofing
WSF	Wood Strip Flooring
WT	Weight, Wt (Steel Shape)
XBAR	Crossbar
XH	Extra Heavy
XL	Extra Large
YD	Yard
YR	Year
YS	Yield Strength
Z	Modulus of Section
ZN	Zinc

1.3 DEFINITIONS

A. Definitions of contracting parties (Owner, Owner's Project Manager, General Contractor, and Architect): Refer to Section 01 10 00 –SUMMARY.

B. Definitions for terms utilized in the Contract Documents:

1. "As necessary," "as directed," "when directed," "satisfactory," "good and sufficient," "approved," or other general qualifying terms are used on the Drawings: These terms are deemed to be followed by the words, "in the opinion of the Architect," or "by the Architect," as the case may be."
2. "Addenda": written or graphic instruments issued prior to the execution of the Contract which modify or interpret the Bidding Documents, including the Drawings and Specifications, by additions, deletions, clarifications or corrections.
3. "Approval," "approved, "approved equal," "or equal," or "other approved" means as approved by the Architect."
4. The terms "Contractor" and "General Contractor" as used in the Project Manual have the same meaning and are interchangeable in Contract Documents. These terms refer to the same entity.
5. The term "Day": is defined as the following:
   a. The term "calendar day" is a full 24 hour period, starting from 12 AM (midnight), and includes all weekends and legal holidays.
   b. The term "working day" shall mean any calendar day except Saturdays, Sundays, and legal holidays at the place of the building.
   c. Where the term "day" is used without the adjective of "calendar" or "working", it shall mean "calendar day".
6. Furnish and Install" or "Provide": items identified shall be furnished and installed under this Contract. The term "Furnish", when used separately, shall mean that the items referred to shall be furnished, only. Similarly the term "install", when used separately, shall mean that the items referred to shall be installed, only.
7. "Knowledge," "recognize" and "discover," their respective derivatives and similar terms in the Contract Documents, as used in reference to the Contractor, shall be interpreted to mean that which the Contractor knows (or should know), recognizes (or should recognize) and discovers (or should discover) in exercising the care, skill and diligence required by the Contract Documents. Analogously, the expression "reasonably inferable" and similar terms in the Contract Documents shall be interpreted to mean reasonably inferable by a Contractor familiar with the Project and exercising the care, skill and diligence required of the contractor by the Contract Documents.
8. "Not in Contract" or "N.I.C.": equipment, furnishings, or other materials not included as a part of this Contract.
9. "Product": materials, systems and equipment.

C. Definitions pertaining to sustainable development: As defined in ASTM E 2114 - *Standard Terminology for Sustainability Relative to the Performance of Buildings,* and as specified herein.

1. "Biobased Materials": As defined in the Farm Security and Rural Investment Act, for purposes of Federal procurement of biobased products, "biobased"

means a “commercial or industrial product (other than food or feed) that is composed, in whole or in significant part, of biological products or renewable domestic agricultural materials (including plant, animal, and marine materials) or forestry materials.” Biobased materials also include fuels, chemicals, building materials, or electric power or heat produced from biomass as defined by The Biomass Research and Development Act of 2000.

a. “Biobased Content”: The amount of biobased carbon in the material or product as a percentage of weight (mass) of the total organic carbon in the material or product.

2. “Chain-of-Custody: Process whereby a product or material is maintained under the physical possession or control during its entire life cycle.
3. “Composite panel products”: Manufactured wood products including, but are not limited to particle board (PB), Medium Density Fiberboard (MDF), wheatboard and strawboard and similar manufactured products
4. “Deconstruction: Disassembly of buildings for the purpose of recovering materials.
5. “DfE (Design for the Environment)”: A technique that includes elements of resource conservation and pollution prevention as applied in various product sectors. A technique that incorporates approaches which are part of product (or assembly) concept, need and design. Considerations involve material selection, material and energy efficiency, reuse, maintainability and design for disassembly and recyclability. Refer to ISO Guide 64, and EPA’s website at http://www.epa.gov/dfe/ for additional clarification on Design for the Environment for additional clarification
6. “Environmentally preferable products”: Products and services that have a lesser or reduced effect on the environment in comparison to conventional products and services. Refer to EPA’s Final Guidance on Environmentally Preferable Purchasing for more information <http://www.epa.gov/epp/guidance/finalguidancetoc.htm>.
7. “Non-Renewable Resource”: A resource that exists in a fixed amount that cannot be replenished on a human time scale. Non-renewable resources have the potential for renewal only by geological, physical, and chemical processes taking place over of millions of years. Examples include: iron ore, coal, and oil.
8. “Perpetual Resource”: A resource that is virtually inexhaustible on a human time scale. Examples include solar energy, tidal energy, and wind energy.
9. “Recycled Content Materials”: Products that contain preconsumer or post-consumer materials as all or part of their feedstock. Recycled content claim shall be consistent with Federal Trade Commission (FTC) Guide for the Use of Environmental Marketing Claims.
10. “Renewable Resource”: A resource that is grown, naturally replenished, or cleansed, at a rate which exceeds depletion of the usable supply of that resource. A renewable resource can be exhausted if improperly managed. However, a renewable resource can last indefinitely with proper stewardship. Examples include: trees in forests, grasses in grasslands, and fertile soil.

1.4 REFERENCE STANDARDS

A. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by DATE OF ISSUE for Contract Documents, current on date of Owner-Contractor Agreement.

C. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

D. The contractual relationship to the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

E. Schedule of References

1. Listed below are abbreviations for the names and titles of trade association names, federal government agencies and similar organizations which are referenced in the individual specification sections. The addresses and phone numbers provided are for the Contractor's convenience and are believed to be current and accurate, however addresses and phone numbers frequently change, and no assurance is made on their accuracy:

AA	Aluminum Association 900 19th Street N.W., Suite 300 Washington, DC 20006 www.aluminum.com
ABAA	Air Barrier Association of America 1600 Boston-Providence Highway Walpole, MA 02081 www.airbarrier.org
AAMA	American Architectural Manufacturer's Association 1827 Walden Office Sq., Suite 104 Schaumburg, IL 60173-4268 www.aamanet.org
AASHTO	American Assoc. of State Highway & Transportation Officials 444 N. Capitol Street NW, Suite 249 Washington, DC 20001 www.aashto.org
ACI	American Concrete Institute, International 38800 Country Club Drive, Farmington Hills, Michigan 48331 www.aci-int.org
ACPA	American Concrete Pipe Association 222 West Las Colinas Boulevard, Suite 641, Irving TX www.concrete-pipe.org
ADC	Air Diffusion Council 104 S. Michigan Ave, Suite 1500, Chicago, IL 60603 www.flexibleduct.org
AFPA	American Forest & Paper Association (Formerly NFPA National Forest Products Association) 1111 19th St. N.W., Suite 800, Washington, DC 20036 www.afandpa.org
AGA	American Gas Association Inc. 1515 Wilson Blvd. Arlington, VA 22209-2469 www.agagas.com
AGAI	American Galvanizers Association Inc. 12200 E.Lliff Ave, Suite 204, Aurora, CO 80014-1252

	www.galvanizeit.org
AIA	American Institute of Architects 1735 New York Avenue, N.W., Washington, DC 20006-5292 www.aia.org
AISC	American Institute of Steel Construction 1 E. Wacher Dr., Suite 3100, Chicago,IL 60601-2001 www.aisc.org
AMCA	Air Movement and Control Association 30 W. University Drive, Arlington Heights, IL 60004-1893 www.amca.org
ANSI	American National Standards Institute 11 W. 42nd Street, 13 Floor, New York, NY 10036 www.ansi.org
APA	APA - The Engineered Wood Association (formerly APA - American Plywood Association) P.O. Box 11700, Tacoma, WA 98411-0070 www.apawood.org
ARI	Air-Conditioning and Refrigeration Institute 4301 N. Fairfax Dr., Suite 425, Arlington, VA 22203 www.ari.org
ASCA	Architectural Spray Coaters Association 230 West Wells Street, Suite 311, Milwaukee WI 53203 www.aecinfo.com
ASCE	American Society of Civil Engineers 1015 15th St. N.W., Washington, DC 20005 www.asce.org
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers 1791 Tullie Circle NE, Atlanta GA.30329 www.ashrae.org
ASME	American Society of Mechanical Engineers 345 East 47th Street, New York, NY 10017-2392 www.asme.org
ASTM	American Society for Testing and Materials 100 Barr Harbor Drive, West Conshohocken, PA 19428 www.astm.org
AWI	Architectural Woodwork Institute 1952 Isaac Newton Square W., Reston, VA 20190 www.awinet.org
AWPA	American Wood Preservers' Association P.O. Box 286, Woodstock, MD 21163-0286 www.awpa.com
AWPI	American Wood Preservers' Institution 1945 Old Gallows Rd., Suite 150, Vienna, VA 22182 www.oas.org
AWS	American Welding Society 550 LeJeune Road, N.W., Miami, FL 33126 www.aws.org
BHMA	Builders Hardware Manufacturers Association, Inc. 355 Lexington Ave., 17 Floor New York, NY 10017 www.buildershardware.com
CDA	Copper Development Association

	260 Madison Ave., 16th Floor, New York, NY 10016 www.copper.org
CISCA	Ceilings & Interior Systems Construction Association 579 W. North Ave., Suite 301, Elmhurst, IL 60126 www.cisca.org
CRI	Carpet and Rug Institute 310 Holiday Ave, Dalton, GA 30720 ww.carpet-rug.com
CRSI	Concrete Reinforcing Steel Institute 933 N. Plum Grove Road, Schaumburg, IL 60173-4758 www.crsi.org
DHI	Door and Hardware Institute 14170 Newbrook Dr., Chantilly, VA 22021-2223 www.dhi.org
FM	Factory Mutual Engineering & Research Corp. 1151 Boston-Providence Turnpike Norwood, MA 02062 www.fmglobal.com
FSC	Forest Stewardship Council (United States Chapter) 1155 30th Street NW, Suite 300, Washington, DC 20007 www.c-f-c.com
GA	Gypsum Association 810 First Street, N.E., Suite 510 Washington, DC 20002 www.gypsum.org
GANA	Glass Association of North America 2945 S.W. Wanamaker Dr., Suite A, Topeka, KS 66612-5321 www.glass.org
GICC	Glazing Industry Code Committee 3310 Harrison St., Topeka, KS 66611-2279 www.glazingcodes.net
IGCC	Insulating Glass Certification Council 3933 US Route 11, PO Box 2040, Cortland, NY 13045 www.igcc.org
LSGA	Laminators Safety Glass Association 3310 Harrison Street, Topeka KS 66611-2279 www.glass.org
MCAA	Mason Contractors Association of America 1910 S. Highland Ave. Suite 101, Lombard, IL 60148 www.masoncontractors.org
MFMA	Maple Flooring Manufacturers Association 60 Revere Drive, Suite 500, Northbrook, IL 60062 www.maplefloor.org
MIL	Military Specifications and Standards Naval Publications and Forms Center 5801 Tabor Avenue, Philadelphia, PA 19120 www.milspec.com
NAAMM	National Association of Architectural Metal Manufacturers 8 South Michigan Avenue, Suite 1000, Chicago, IL 60603 www.naamm.org
NCMA	National Concrete Masonry Association 2302 Horse Pen Road, Herndon, VA 20171-3499 www.ncma.org

NEBB	National Environmental Balancing Bureau 8575 Government Circle, Gaithersburg, MD 20877-4121 www.nebb.org
NEMA	National Electrical Manufacturers' Association 1300 N. 17th St., Suite 1846, Rosslyn, VA 22209 www.nema.org
NFPA	National Fire Protection Association 1 Battery March Park, PO Box 9101, Quincy, MA 02269 www.nfpa.org
NFSHSA	National Federation of State High School Associations PO Box 20626, Kansas City MO. 64195 www.nfhs.org
NRCA	National Roofing Contractors Association O'Hare International Center 10255 W. Higgins Road, Suite 600, Rosemont, IL 60018-5607 www.nrca.net
PCA	Portland Cement Association 5420 Old Orchard Road, Skokie, IL 60077-1083 www.cement.org
PEI	Porcelain Enamel Institute 4004 Hillsboro Pike, Suite 224B, Nashville, TN 37215 www.porcelainenamel.com
PS	Product Standard U. S. Department of Commerce www.omg.org
SDI	Steel Deck Institute P.O. Box 25, Fox River Grove, IL 60021-0025 www.sdi.org
SDI	Steel Door Institute 30200 Detroit Road, Cleveland, OH 44145-1967 www.steeldoor.org
SGCC	Safety Glass Certification Council RMS, P.O. Box 9 Henderson Harbor, NY 13651 www.sgcc.org
SIGMA	Sealed Insulating Glass Manufacturers Association 401 N. Michigan Ave., Suite 2400, Chicago, IL 60611 www.glasschange.com
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association 4201 Lafayette Center Dr., Chantilly, VA 22022-1209 www.smacnapa.org
SSMA	Steel Stud Manufacturer's Association 8 South Michigan Avenue, Chicago IL 60603 www.ssma.com
SSPC	The Society for Protective Coatings 40 24th Street, 6th Floor, Pittsburgh PA 15222-4623 www.sspc.org
SWRI	Sealant, Waterproofing & Restoration Institute 2841 Main Street, Suite 585, Kansas City, MO 64108 www.swrionline.org
TCNA	Tile Council of North America, Inc. 100 Clemson Research Blvd., Anderson, SC 29625 www.tileusa.com *(formerly TCA, Tile Council of America)*

UL	Underwriters' Laboratories, Inc. 333 Pfingston Road, Northbrook, IL 60602 www.ul.com
USGBC	United States Green Building Council 1800 Massachusetts Avenue NW, Suite 300 Washington DC 20036 www.usgbc.org
WDMA	Window & Door Manufacturers Association (formerly National Wood Window & Door Association, NWWDA) 205 E. Touhy Avenue, Suite G-54, Des Plaines, IL 60018 www.nwwda.org

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

End of Section

SECTION 01 45 00

QUALITY CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. General quality assurance and control of installation.

B. Site safety, worker safety and training.

C. Source quality control.

D. Field samples and in-place mock-ups.

E. Manufacturer's field services and reports.

F. Field quality control, Owner's right for confirmation.

1.2 GENERAL QUALITY ASSURANCE AND CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply fully with manufacturers' instructions, including performance of each step in sequence. Notify Architect when manufacturers' instructions conflict with the provisions and requirements of the Contract Documents; obtain clarification before proceeding with the work affected by the conflict.

C. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate high standards or more precise workmanship.

D. Perform work by persons qualified to produce workmanship of specified quality.

E. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.3 SITE SAFETY, WORKER SAFETY AND TRAINING

A. General: The General Contractor, subcontractors and Filed Sub Contractors shall, at all times, exercise reasonable precautions for the safety of all persons. All rules, regulations, and laws concerning safety that are in effect at the work site, and in particular, all applicable regulations of the Occupational Safety and Health Administration (OSHA) of the U.S. Government, in addition to specified requirements shall be complied with in all respects.

1. Construction Manager's responsibility for safety shall apply continuously twenty four (24) hours per Day during the term of this Contract and is not limited to normal working hours.

B. General Contractor's safety program: Prior to commencement of the Work, the General Contractor shall develop and implement a Safety and Health Plan to comply with the Occupational Safety and Health Administration (OSHA) standards for the Construction Industry and all other applicable Federal, State, local laws and regulations. General Contractor's Safety and Health Plan, and included health and safety procedures and policies, shall be submitted to the Architect and Owner's Representative within fifteen (15) Days after the date of Notice to Proceed and in no event later than commencement of the Work, whichever occurs first.

1. Perform pre planning to ensure access Is provided to Fire Department for all areas of the work site throughout the duration of the Contract. The General Contractor shall provide the Fire Department site access maps, updated regularly, to reflect changes in the layout of the work site and shall notify the Fire Department when each update is made
2. Post and maintain, at prominent locations throughout the Project site, emergency telephone numbers and shall insure that all personnel on site are continuously aware of this information.
3. Ensure safe access to the Work for the Owner, Architect, Architect's consultants, their designated representatives, and all others charged with inspection, testing and monitoring of the Work, and visitors to the site. The Construction Manager shall furnish site visitors with safety equipment, test equipment, safety apparel and instructions that are required to insure their safety on site, and In the performance of their duties related to the Work of this Contract

C. All employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration (OSHA) that is at least 10 hours in duration. The OSHA training and certification course shall occur at the time each employee begins work. Furnish documentation to Owner and Architect, for each employee documenting successful completion of the OHSA safety training and certification course. Submit with the first certified payroll report. Comply fully with all laws and regulations applicable to awards made subject to Massachusetts General Laws (MGL) Chapter 149, Section 44A.

1.4 GENERAL CONTRACTOR QUALITY CONTROL PROGRAM

A. Procedures: General Contractor, Filed Sub Contractors and each subcontractor shall include all labor, materials, equipment, services and incidental items necessary to implement quality control procedures to the extent necessary to demonstrate and maintain compliance with the Contract Documents.

B. It is recognized that the General Contractor maintains standing written procedures as a corporation for the assurance of quality in finished

projects. The Architect and Owner shall review and approve such corporate QA/QC program; review will be against the guidance provided by the following paragraphs and approval may be conditioned with requirements to expand specific sections to meet specific requirements of the Owner and/or the Owner's funders.

C. Quality Control Plan: Within 20 days after Notice to Proceed, the General Contractor shall submit a Quality Control (QC) Plan to the Owner's Representative and Architect for approval. The plan shall address the following, as a minimum:

1. The General Contractor's commitment to quality and implementing and managing the QC program.
2. Identification of the General Contractor's onsite QC Manager, with name, qualifications, duties and responsibilities. The QC Manager shall have the authority to direct the removal and replacement of non-conforming work. The QC Manager shall be present for all QC meetings, inspections and tests during the project.
3. Procedures for addressing and commenting QC with General Contractor's staff, all subcontractors and suppliers, and Owner, Architect and Owner's representative.
4. Procedures for review of submittals and submittal status, and documentation of same.
5. Procedures for pre-installation meetings and documentation of same.
6. Procedures for inspections of deliveries and documentation of same.
7. Procedures for benchmark inspections, defined as initial installations, and documentation of same.
8. Procedures for mockup inspections and documentation of same.
9. Procedures for equipment in place, inspections and documentation of same.
10. Procedures for inspections prior to closures of concealment and documentation of same.
11. Procedures for start-up and commissioning and documentation of same.
12. Procedures for turnover and documentation of same.
13. Procedures for identifying, recording, tracking correcting and reporting items requiring rework, using a Rolling Completion list chronological item number, phase area, date listed, description, party responsible for correction, date notified, and date corrected.
14. Procedures for testing and documentation of same.
15. Procedures for corrective action on Architect's Field Reports and Testing Agency reports and documentation of same.

D. Procedures for reporting on all of the above on a monthly basis as a condition precedent to review of the General Contractor's application for payment.

1.5 SOURCE QUALITY CONTROL

A. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Product Labeling: Attach label from agency approved by authority having jurisdiction for products, assemblies, and systems required to be labeled by applicable code(s).

1. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label.

a. Model number.

b. Serial number.

c. Performance characteristics.

1.6 FIELD SAMPLES

A. Install field samples demonstrating quality level for the Work, at the site as required by individual specifications Sections for review and acceptance by Architect. Remove field samples prior to date of Final Inspection, or as directed.

1.7 MANUFACTURER'S FIELD SERVICES AND REPORTS

A. When called for by individual Specification Sections, provide at no additional cost to the Owner, manufacturers' or product suppliers' qualified staff personnel, to observe site conditions, start-up of equipment, adjusting and balancing of equipment, conditions of surfaces and installation, quality of workmanship, and as specified under the various Sections.

1. Individuals shall report all observations, site decisions, and instructions given to applicators or installers. Immediately notify Architect of any circumstances which are supplemental, or contrary to, manufacturer's written instructions.

2. Submit full report within 30 calendar days from observed site conditions to Architect for review.

1.8 FIELD QUALITY CONTROL

A. The Owner reserves the right to take samples and perform, at random, tests of approved materials delivered to the job site to verify compliance of actual materials with specifications.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 50 00

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

1.01 GENERAL CONDITIONS

A. The "Standard Form of Agreement," as provided, Electronic Format, as published, together with all Amendments and Supplements as hereinbefore listed, shall apply and are hereby made a part of this section of the Specifications.

B. The Sections of these Specifications entitled "Special Conditions," "Minimum Wage Determination," and Division 1 "General Requirements" shall apply and are hereby made a part of this section of the Specifications.

1.02 REQUIREMENTS

A. Temporary Water
B. Weather Protection
C. Temporary Power
D. Hoisting Equipment and Machinery
E. Staging
F. Maintenance of Access
G. Dust Control
H. Noise Control
I. Cleaning During Construction
J. Sanitary Facilities
K. Use of Site

1.03 TEMPORARY WATER

A. The contractor shall arrange with the facility if he/she requires water for use during construction. Water will be furnished without cost to the contractor, but he shall pay for the cost to install, maintain and removal of any necessary temporary connections. All such temporary connections and removal of same, and use of water shall be done in a manner so as not to interfere with the facility's normal operations and any existing areas damaged shall be put back to their original condition.

B. Use of water may be discontinued by the Town / City if, in the opinion of the Town / City, it is wastefully used.

C. The General Contractor shall provide an adequate supply of drinking water from approved sources of acceptable quality, satisfactorily cooled, for his employees and those of his sub-contractors.

1.04 TEMPORARY WEATHER PROTECTION

A. Proposed Plan: The General Contractor shall within 30 calendar days after Award of Contract, submit three copies of a typewritten proposed plan for "Weather Protection" and obtain the Architect's and Owner's written approval.

B. Reporting Requirements:
1. Within 10 calendar days after Contract award, the General Contractor shall submit in writing to the Owner for approval, three copies of its proposed plan for weather protection.

2. The General Contractor shall furnish and install accurate Fahrenheit thermometers at three places designated by the Owner to determine whether the required temperature is being maintained. Thermometers shall indicate both high and low temperatures in a 24 hour period.

C. Weather protection materials, equipment, and the installation thereof, shall comply with all the safety rules and regulations including provisions for adequate ventilation and fire protection devices.

D. Additional weather protection requirements: The General Contractor is responsible to ensure that the protection is provided by for all materials and equipment from weather as required for the nature of the materials acceptable for installation or equipment used. (year round).

1. Where removal of existing roofing, roof sheathing, windows, doors, and other items is necessary to accomplish work, have materials and workmen ready to provide adequate and approve temporary covering of exposed areas.

2. Temporary coverings shall be attended as necessary to insure effectiveness and to prevent displacement.

3. Contractor shall repair or replace all elements of the building damaged by failure to properly protect them from the weather to the satisfaction of the Architect at no additional cost to the Owner.

1.04 TEMPORARY POWER

A. If contractor requires electrical power, they shall arrange for and pay for installation and removal of a temporary service with the local utility, or provide a generator and fuel. Costs for temporary power are to be included as part of the work.

1.05 HOISTING EQUIPMENT AND MACHINERY

A. All hoisting equipment and machinery required for the proper and expeditious prosecution and progress of the work shall be furnished, installed, operated and maintained in safe condition by the General Contractor for the use of all sub-contractor's material and/or equipment delivered to the designated hoisting area except that which is specifically required to be provided by the sub-contractors themselves and is so stated in each appropriately related section of the specifications. All costs for hoisting operating services shall be borne by the general contractor.

1.06 STAGING

A. All staging, exterior and interior, required to be over eight feet in height, shall be furnished and erected by the general contractor and maintained in safe condition by him/her without charge to and for the use of all trades as needed by them for proper execution of their work except where specified to the contrary in any filed sub-bid section of the project manual.

1.07 MAINTAIN ACCESS

A. The general contractor shall maintain all entrances and exits from the building for the duration of the contract as well as access to and around the building for vehicular traffic and authorized personnel.

B. Workers' access to the building will be limited to those entrances designated by the Architect in consultation with School officials. The contractor shall protect all floors, walls, ceilings and other finished surfaces from damage. Any surfaces damaged shall be repaired to the Architect's satisfaction. Thoroughly clean all surfaces at the completion of the work.

C. All materials resulting from demolition and removal operations shall be transported to the ground into dumpster bodies via suitable enclosed chutes.

1.08 DUST CONTROL

A. The general contractor shall provide adequate means for the purpose of preventing dust caused by construction operations throughout the period of the construction contract.

B. The committing of nuisances and creating dust on the land of the Town and adjacent property shall be rigorously prohibited and adequate steps taken to prevent it.

C. This provision does not supersede any specific requirements for methods of construction or applicable general conditions set forth in the Contract Articles with added regard to performance obligations of the general contractor.

1.09 NOISE CONTROL

A. Develop and maintain a noise-abatement program and enforce strict discipline over all personnel to keep noise to a minimum. The work environment of the school must not be disrupted and noisy activities must be kept to an absolute minimum.

B. Execute construction work by methods and by use of equipment which will reduce excess noise.
   1. Equip air compressors with silencers, and power equipment with mufflers.
   2. Manage vehicular traffic and scheduling to reduce noise.

1.10 CLEANING AND PROTECTION DURING CONSTRUCTION

A. Unless otherwise specified under the various trade sections of the specifications, the general contractor shall perform daily clean-up operations during construction as herein specified. Location of any dumpsters, storage trailers, or equipment left overnight shall be closely coordinated with and approved by the school.

B. Control accumulation of waste materials and rubbish; periodically dispose of off-site. The general contractor shall bear all costs, including fees resulting from such disposal.

C. Maintain project in accordance with all local, Commonwealth of Massachusetts and Federal Regulatory Requirements.

D. Store volatile wastes in covered metal containers and remove from premises.

E. Prevent accumulation of wastes which create hazardous conditions.

F. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
   1. Do not burn or bury rubbish and waste materials on site.
   2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.

G. All areas of the grounds, walks, bushes, etc., shall be restored to their original condition prior to construction and any damage caused by workmen, staging, chemicals, etc., shall be repaired by contractor at no cost to the City.

1.11 TOILET FACILITIES

A. The contractor shall, at his/her own expense, provide the necessary toilet facilities for the workers in a location approved by the Owner. Separate facilities shall be provided for male and female employees. These facilities shall be open to the use of the Clerk of the Works, other contractors and their employees. The toilet shall be removed upon completion of the work, and the premises left clean and odorless. All temporary toilet facilities shall comply with the requirements of the Commonwealth of Massachusetts, county and town. The toilet facilities in the existing facilities shall **not** be used by the contractor or his/her sub-contractors.

1.12 TEMPORARY SITE OFFICE

A. Temporary Site Office
At the Owner's discretion, a temporary designated room in the school can be used as weekly meeting space to conduct progress meeting on the project.

1.13 USE OF SITE

A. New construction and alterations work shall be scheduled and performed in a manner that will provide a minimum of interference with the operation of the school which will be occupied during the construction and renovation work. Heat, light, ventilation, power, vehicle access and legal egress shall be maintained in the building at all times. The contractor shall provide the Owner with a schedule outlining all roof areas where work will be performed at the commencement of contract for coordination of Owner activities. The Owner must agree to the schedule prior to commencement of work. No work shall be performed in Owner activity areas without prior approval from Owner.

B. The contractor shall consult with the Architect and Owner and ascertain when drilling, jack hammering, and like noisy operations may be performed.

C. In scheduling the work there are certain spaces where no work will be permitted to be performed while space is occupied. Where it is necessary to install plumbing, heating, ventilating, air condition and electrical work in these spaces in order to complete the work, the contractor will be advised by the architect when these spaces are unoccupied and such work can be performed. If necessary to maintain the schedules and specified completion dates, the contractor shall perform portions of the work during a 3:00 p.m. to 11:00 p.m. shift without additional cost to the Town. The contractor shall remove all materials, tools and debris and broom clean these spaces at the end of each work day.

D. The owner may exercise the option to permit minor alterations to be performed in occupied spaces during periods when they are in use. The spaces shall be left broom clean at the end of each work period. Failure to maintain these occupied spaces in a clean condition will cause discontinuance of remodeling work in occupied spaces until such time as they can be vacated.

E. Use only those areas so designated by the School Department for construction and personnel parking, storage needs, etc.

F. Arrange and maintain materials in orderly manner with use of walks, drives, roads, and entrances unencumbered.

G. Before starting work, a 6 foot chain link fence with fabric shall be erected completely around the construction area. The fencing shall be moved or relocated from time to time as the work progresses in order to safeguard the public from the hazards of the construction area.

END OF SECTION

SECTION 01 52 40
DEMOLITION AND CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition and construction waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction waste.
4. Legal Removal and Disposal of Fluorescent Lamp and light Ballasts

B. Related Sections include the following:
1. Division 1 Section "Selective Demolition" for disposition of waste resulting from partial demolition of acoustical ceiling, GWB / masonry, walls, ceilings and construction materials.

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

A. General: Develop waste management plan that results in End-of-Project rates for salvage/recycling of 75 percent by weight of total waste generated by the Work.

B. Salvage/Recycle Requirements: Owner's goal is to salvage and recycle as much nonhazardous demolition and construction waste as possible including the following materials:

1. Demolition Waste:
   a. Brick (if required to be removed)
   b. Concrete masonry units (if required to be removed)
   c. Wood nailers, grounds and blocking
   d. Plywood and oriented strand board
   e. Wood trim.
   f. Structural and miscellaneous steel.
   g. Insulation.

2. Construction Waste:
   a. Lumber
   b. Wood trim
   c. Metals
   d. Insulation
   e. Electrical conduit and wire
   f. Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:

      1) Paper
      2) Cardboard
      3) Boxes
      4) Plastic sheet and film
      5) Polystyrene packaging
      6) Wood crates
      7) Plastic pails

1.5 SUBMITTALS

A. Waste Management Plan: Submit 3 copies of plan within 7 days of date established for Notice to Proceed.

B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit three copies of report. Include separate reports for demolition and construction waste. Include the following information:

1. Material category
2. Generation point of waste
3. Total quantity of waste in tons
4. Quantity of waste salvaged, both estimated and actual in tons
5. Quantity of waste recycled, both estimated and actual in tons
6. Total quantity of waste recovered (salvaged plus recycled) in tons
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste

C. Waste Reduction Calculations: Before request for Substantial Completion, submit three copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction, including but not limited to, Massachusetts solid waste regulations contained in 310 CMR 16.00 and 310 CMR 19.000.

1.7 WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Include separate sections in plan for demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement waste management plan as approved by Owner Project Manager. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with Division 1 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Division 1 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Owner's Use:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.

4. Transport items to Owner's storage area as designated by Owner.
5. Protect items from damage during transport and storage.

C. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Receivers and Processors: List below is provided for information only; available recycling receivers and processors include, but are not limited to, the following:

1. A listing of other available recycling receivers and processors are provided in the Massachusetts Recycling Directory, Available from the Massachusetts State Bookstore located in the State Capitol Building, for recycling operations within the Commonwealth of Massachusetts or, http://www.mass.gov/dep/recycle/solid/swfacil.htm

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

A. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

B. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

C. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

D. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

E. Roof Fixtures and Drains: Separate by type and size.

F. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION

SECTION 01 60 00

MATERIALS AND EQUIPMENT

1.01 GENERAL CONDITIONS

A. The Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. The Sections of these Specifications entitled "Special Conditions," "Minimum Wage Determination," and Division 1 "General Requirements" shall apply and are hereby made a part of this section of the Specifications.

1.02 PRODUCTS

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.03 MANUFACTURING INSTRUCTIONS

A. When work is specified to comply with the manufacturer’s instructions, submit copies as specified in Section 01 33 00 Submittals, and distribute copies to persons involved, and maintain one set in field office.

B. Perform work in accordance with details of instructions and specified requirements.

1.04 TRANSPORTATION AND HANDLING

A. Refer to Contract and General Conditions and Specifications sections for requirements pertaining to transportation and handling of materials and equipment.

B. Transport products by method to avoid product damage; deliver in undamaged condition in manufacturer’s unopened containers or packaging, dry.

C. Provide equipment and personnel to handle products by methods to prevent soiling or damage.

D. Promptly inspect shipments to assure that products comply with requirements, that quantities are correct, and products are undamaged.

1.05 STORAGE AND PROTECTION

A. Refer to Contract and General Conditions and Specification section for requirement pertaining to transportation and storage and protection of materials and equipment.

B. Store products in accordance with manufacturer’s instructions, with seals and labels intact and legible. Store sensitive products in weather tight enclosures; maintain within temperature and humidity ranges required by manufacturers instructions.

C. For exterior storage of fabricated products, windows, store front assemblies, doors assemblies adhesives and glues, interior finishes and materials shall be stored in watertight enclosed metal

container free of weather conditions. No outside tarped storage will be allowed.

D. Arrange storage to provide access for inspection. Periodically inspect to assure that products are undamaged, and are maintained under required conditions.

E. No extended storage of materials will be permitted on site. Delivery of materials shall be scheduled in a manner that will limit “on site time” to 45 days or less before installation.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Definition of Terms

B. Basic product requirements.

C. Owner's proprietary products.

D. Product delivery requirements.

E. Product storage and handling requirements.

F. Construction waste management.

1.2 RELATED REQUIREMENTS

A. Section 01 25 13 - PRODUCT SUBSTITUTION PROCEDURES:

1. Product options.
2. Product substitution procedures.

B. Section 01 52 40 – DEMOLITION AND CONSTRUCTION WASTE MANAGEMENT: Procedural and administrative requirements for construction and demolition recycling.

1.3 DEFINITIONS

A. "Products" is defined as new material, machinery, components, equipment, fixtures, and systems used in the Work. Products do not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for re-use.

B. "Materials" are products that are shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.

C. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

D. "Fasteners" include all products required for mechanical connections and include, but are not limited to: nails, screws, bolts, expansion bolts, chemical bolts, epoxy anchors, pins, powder-actuated devices, and similar fasteners, anchors, and connections.

E. Definitions in this article are not intended to negate the meaning of other terms used in Contract Documents, including "specialties", "systems", "structure", "finishes", "accessories", "furnishings", "special construction", and similar terms, which are self-explanatory and have recognized meanings in the construction industry.

1.4 BASIC PRODUCT REQUIREMENTS

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

1. Where possible utilize materials harvested and manufactured regionally, within a 500-mile radius of the project site.

B. To the fullest extent possible, provide products of the same kind, from a single source.

C. Provide interchangeable components of the same manufacturer, for similar components.

D. When the Contractor has the option of selecting two or more products, ensure that products selected shall be compatible with products previously installed or approved.

E. Provide all products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.

F. Galvanic Corrosion: Install materials in manner which will effectively isolate dissimilar metals which may potential for galvanic corrosion. Use non-absorptive dielectric material, isolation coatings, or other protective isolator approved by Architect.

G. Fasteners, Anchors, and Connections: Provide all fasteners, anchors, and connections needed to safely, securely, and appropriately secure all Work permanently in place.

1. General: The Contractor is solely responsible for the capacity, suitability, adequacy, and safety of all welded, fastened and anchored connections.
    a. Comply with applicable code requirements regarding fastener selection and installation.
    b. Provide at least two fasteners for each individual item being fastened.
    c. Utilize fastener manufacturer's published load tables for working loads to assist in determining fastener size and space. Do not use ultimate load capacity in determining fastener selections.
    d. Provide a minimum safety factor of 4.
    e. Select and utilize fasteners having minimum galvanic corrosion factor.
    f. Hydrogen embrittlement prevention:
        1) Do not use high-strength and low-alloy fasteners which have been subjected to an acid pre-treatment (because they can become brittle and fail), utilize instead equivalent capacity and size bi-metal, stainless steel or high strength aluminum fasteners, as appropriate to the conditions and materials where being used.
        2) Utilize low-hydrogen electrodes for welding high-strength steels to prevent hydrogen embrittlement.
2. To permit the Contractor control over means and methods, some fastener conditions may not be fully defined in the Contract Documents. In particular, individual specification sections that require delegated independent engineering. In such instances the Contractor is fully responsible to determine method of fastening appropriate for each condition. The Contractor shall take into consideration substrate material(s) and product(s) being fastened, live and dead loading, and both atmospheric and visual exposure considerations. Contractor is responsible to determine fastener type, material, finish, size, diameter, length and spacing.
3. Torque structural fasteners as recommended by fastener manufacturer, or as otherwise specified in the Contract Documents.

H. Permanent Labels and Nameplates:

1. Restrictions:
    a. Do not provide exposed-to-view labels, nameplates, or trademarks which are not required by code, or regulations.

b. Do not expose manufacturers, suppliers, or installer's name, logo, or trade names on normally visible surfaces.

c. Do not provide labels, nameplates or trademarks when individual specification sections specifically exclude them.

d. All exposed-to-view advertising and name-brand labels shall be fully removed without damage to substrate finish.

2. Location for required labels: Required labels, approval plates and stamps shall be located on a concealed surface, or where required for observation after installation on accessible non-conspicuous surface.

3. Data Plates: Provide permanent data plate on each item of service-connected or power-operated equipment.

a. Data Plate Information: Include manufacturer, model, serial number, date of manufacture, capacity, ratings, power requirements, and all other similar essential data.

b. Locate data plates on easily accessible surface that is inconspicuous in occupied spaces.

1.5 GENERAL ENVIRONMENTAL REQUIREMENTS FOR PRODUCTS

A. General: Comply as specified herein. Prohibit the use of or incorporation into the work of materials which contain toxic, hazardous and harmful materials.

1. Hazardous materials: Defined as pesticides, biocides, and carcinogens as listed by recognized authorities, such as the Environmental Protection Agency (EPA), the International Agency for Research on Cancer (IARC) or regulated under OSHA Hazard Communication Standard, 29 CFR 1910.1200.

2. Harmful materials: Defined as materials which contain the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances; or degrade the utility of the environment for aesthetic, cultural, or historical purposes.

3. Owner restricted materials: Defined as all products to which the Owner has a reasonable objection because of its content, composition, properties, or characteristics.

B. Vapors, Gases, Fumes, Odors:

1. General: Comply with all state and federal VOC requirements. Wherever possible use non-VOC materials.

a. Limit use of products to the greatest extent possible which have "off-gassing", fumes, flammability, and other harmful characteristics.

1) Prohibit use of products which contain substances that contribute significantly to the production of photochemical smog, tropospheric ozone, or poor indoor-air quality.

b. Limit use of ozone-depleting compounds to the greatest extent possible. An ozone-depleting compound is any compound with an ozone-depletion potential greater than 0.01 (CFC 11 = 1).

c. Use organic and biodegradable cleaners to the greatest extent possible.

2. Do not install, use for installation, and use for cleaning those materials which may produce objectionable (to Owner and public) vapors, gases, fumes, odors, or similar conditions.

3. Do not install or use products which may have possible chemical or biological reactions with other on-site materials.

C. Sealants: Provide products that comply with specified VOC limits. Refer to Section 07 92 00 – JOINT SEALANTS for additional requirements.

1. Only use sealant and primers that comply with the following limits for VOC content:
   a. Architectural Sealants: 250 g/L.
   b. Roofing Sealants: 450 g/L
   c. Roadway Sealants: 250 g/L.
   d. Sealant primer: 250 g/L
2. Sealants containing aromatic solvents, fibrous talc, formaldehyde, halogenated solvents, mercury, lead, cadmium, chromium and their compounds, are not permitted.
3. Avoid the use of the following products: Butyl Rubber; Solvent Acrylic; Neoprene; Styrene Butadiene Rubber; Nitril.

D. Material Safety Data Sheets (MSDS): Obtain and maintain on-site record data sheets for each product brought onto the Site.

1. Maintain an organized file of Material Safety Data Sheets at the job-site for quick reference.
2. Furnish MSDS for all finishes, paints, coatings, curing compounds, sealers, adhesives, mastics, waterproofing, dampproofing, sealants, cleaning chemicals, carpets, upholstery, fabrics and all similar products.

E. Cleaning and maintenance products:

1. Provide data on manufacturers' recommended maintenance, cleaning, refinishing and disposal procedures for materials and products utilized. These procedures are for final Contractor cleaning of the project prior to substantial completion and for provided materials and products by the specific specification sections.
   a. Where chemical products are recommended for these procedures, provide documentation to indicate that no component present in the cleaning product at more than 1% of the total mass of the cleaning product is a carcinogen or reproductive toxicant as defined in the lists in this specification section.
   b. For purposes of reporting, identification of product VOC contents shall not be limited to those regulated.
2. Avoid cleaning products containing alpha-pinene, d-limonene or other unsaturated carbon double bond alkenes due to chemical reactions with ozone to formaldehydes, acidic aerosols, and ultra fine particulate matter in indoor air.

F. Establish written Contractor's safety and emergency response procedures for safety precautions, accidents, emergency conditions, and clean-up methods.

1.6 OWNER'S PROPRIETARY PRODUCTS

A. Refer to Section 08 71 00 for proprietary Door Hardware

1.7 PRODUCT DELIVERY AND HANDLING REQUIREMENTS

A. Transport and handle products in accordance with manufacturer's instructions and as specified in individual specification sections.

1. Packing: Arrange for the return of packing materials, such as wood pallets, where economically feasible.

B. Packaging: Deliver materials in recyclable or in reusable packaging such as cardboard, wood, paper, or reusable blankets, which will be reclaimed by supplier or manufacturer for recycling.

1. General: Minimize packaging materials to maximum extent possible while still ensuring protection of materials during delivery, storage, and handling.

a. Unacceptable Packaging Materials: Polyurethane, polyisocyanurate, polystyrene, polyethylene, and similar plastic materials such as “foam” plastics and “shrink-fit” plastics.

b. Reusable Blankets: Deliver and store materials in reusable blankets and mats reclaimed by manufacturers or suppliers for reuse where program exists or where program can be developed for such reuse.

1) Non-returnable containers should be donated to local and community organizations to the greatest extent possible to reduce quantity of disposed materials.

c. Pallets: Where pallets are used, suppliers shall be responsible to ensure pallets are removed from site for reuse or for recycling. Avoid use of virgin wood pallets whenever possible. It is preferable that pallets be manufactured from recycled wood and recycled plastic.

d. Corrugated Cardboard and Paper: Where paper products are used, recycle as part of construction waste management recycling program, or return to material’s manufacturer for use by manufacturer or supplier.

e. Sealants, Paint, Primers, Adhesives, and Coating Containers: Return to supplier or manufacturer for reuse where such program is available.

2. Purchase materials in bulk where possible. Take measures to avoid individual packaging for volume purchases.

C. Labeling of plastics used for packaging: Plastic is marked by manufacturers for type of plastic material in accordance with the Society of Plastic resin codes. Maintain marks, or sort by manufacturer’s resin codes for recycling purposes.

1. Type 1: Polyethylene Terephthalate (PET, PETE).
2. Type 2: High Density Polyethylene (HDPE).
3. Type 3: Vinyl (Polyvinyl Chloride or PVC).
4. Type 4: Low Density Polyethylene (LDPE).
5. Type 5: Polypropylene (PP).
6. Type 6: Polystyrene (PS).
7. Type 7: Other. Use of this code indicates that the package in question is made with a resin other than the six listed above, or is made of more than one resin listed above, and used in a multi-layer combination.

D. Schedule deliveries to avoid delays in installation of products, to minimize long-term storage, to prevent overcrowding of construction spaces and to limit potential damage to stored materials. Coordinate with installation to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.

E. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

F. Provide equipment and personnel to handle and store products by methods to prevent soiling, disfigurement, or damage.

1.8 PRODUCT STORAGE AND PROTECTION REQUIREMENTS

A. Store and protect products in accordance with manufacturer's instructions and as specified in individual specification sections.
   1. Provide all necessary equipment and personnel to store products by methods to prevent soiling, disfigurement and damage.
   2. Avoid excessive material handling and potential product damage, locate storage areas convenient to work areas.
   3. Store and protect products with seals and labels intact and legible.
   4. Store and handle materials in a manner as to prevent loss from weather and other damage.

B. For exterior storage of fabricated products, place on sloped supports, above ground.

C. Provide off-site storage and protection when site does not permit on-site storage or protection.
   1. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
   2. Store sensitive products in weather-tight, climate controlled enclosures.
   3. Prevent contact with material that may cause corrosion, discoloration, or staining.

D. Store loose granular materials on solid flat surfaces in a well-drained area; prevent mixing with foreign matter.

E. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

F. Store heavy materials in locations and in a manner that will not damage or disfigure existing, or new construction.

1.9 CONSTRUCTION WASTE MANAGEMENT

A. General: Comply with requirements of Section 01 74 19 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

B. Source separation: Separate, store, protect, and handle at the site identified recyclable and salvageable waste products in order to prevent contamination of materials and to maximize recyclability and salvageability of identified materials.

C. Return: Set aside and protect incorrectly delivered and substandard products and materials and return to supplier for credit.

D. Reuse and Salvage: Set aside, sort, and protect separated products and materials for collection, re-use by Owner, as designed for re-use on-site or designated for salvage by Owner's separate waste recycling contractor.

E. Recycling: Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

End of Section

SECTION 01 70 00
CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. The Sections of these Specifications entitled "Special Conditions," "Minimum Wage Determination," and Division 1 "General Requirements" shall apply and are hereby made a part of this section of the Specifications.

1.02 FINAL CLEANING

A. Unless otherwise specified under the various sections of the specifications, the general contractor shall perform final cleaning operations as herein specified prior to final inspection.

B. Maintain project site free from accumulations of waste, debris, and rubbish, caused by operations. At completion of work, remove water, materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave project clean and ready for occupancy.

C. Use only those materials which will not create hazards to health or property and which will not damage surfaces.

D. Use only those cleaning materials and methods that are recommended by the manufacturer or surface material to be cleaned.

E. Broom clean exterior paved surfaces and rake clean other surfaces of the grounds.

1.03 RECORD DRAWINGS

A. Record drawings shall consist of **all** the contract drawings.

B. The general contractor and all subcontractors shall be required to maintain one set of record drawings, as the work relates to their sections of the specifications at the site.

C. The record drawings shall be stored and maintained in the general contractor’s field office apart from other documents used for construction. The record drawings shall be maintained in a clean, dry and legible condition and shall not be used for construction purposes.

D. Record drawings, as submitted by the general contractor, shall be verified in the field by the Architect or his consultants. Verification by the Architect shall occur during the construction process and prior to the related work being completed and covered up.

E. The record drawing shall be available at all time for inspection by the Architects. All deficiencies noted shall be promptly corrected.

F. The following information shall be indicated on the record drawings:

1. Record all changes, including change orders, in the location, size, number and type both horizontally and vertically of all elements of the project which deviate from those indicated on all the contract drawings.

2. The tolerance for the actual location of utilities and appurtenances within the building to be marked on the record drawings shall be plus or minus two (2) inches.

3. The location of all underground utilities and appurtenances referenced to permanent surface improvements, both horizontally and vertically at ten (10) feet intervals and at all changes of direction.

4. The location of all internal utilities and appurtenances, concealed by finish materials, including but, not limited to valves, coils, dampers, vents cleanouts, strainers, pipes, junction boxes, turning vanes, variable and constant volume boxes, ducts, traps and maintenance devices. The location of these internal utilities, appurtenances and devices shall be shown by offsets to the column grid lines on the drawings.

5. Each of the utilities and appurtenances shall be referenced by showing a tag number, area served and function on the record drawings.

G. At the end of each month and before payment for materials installed, the general contractor, his subcontractors, and the Architect shall review record drawings for purpose of payment. IF THE CHANGES IN LOCATION OF ALL INSTALLED ELEMENTS ARE NOT SHOWN ON THE RECORD DRAWINGS AND VERIFIED IN THE FIELD, THEN THE MATERIAL SHALL NOT BE CONSIDERED AS INSTALLED AND PAYMENT WILL BE WITHHELD.

H. At the completion of the contract, each subcontractor shall submit to the general contractor a complete set of his respective record drawings (including an electronic copy in PDF. File format) indicating all changes. After checking the above drawings, the general contractor shall certify in writing on the title sheet of the drawings that they are complete and correct and shall submit the record drawings to the Architect.

I. The Architect shall review the drawings and shall verify by letter to the City of Newton that the work is accurate. The contractor shall arrange to have all changes incorporated on the original drawings. The contractor shall submit to the Architect, reproducible drawings on AUTOCAD disks and Adobe Acrobat files with two sets of prints to be used for the final inspection of the project. Inaccuracies in record drawings, as determined by the Architect, may be grounds for postponement of the final inspection until such inaccuracies are corrected.

1.04 OPERATING AND MAINTENANCE REQUIREMENTS

A. At least one month prior to the time of turning over this contract to the City for Use and Occupancy or Final Acceptance, the general contractor shall secure and deliver to the City via the Architect THREE complete, indexed files containing approved operating and maintenance manuals, shop drawings, and other data as follows:

1. Operating manuals and operating instructions for the various systems.
2. Catalog data sheets for each item of mechanical or electrical or equipment actually installed including performance curves, rating data and parts list.
3. Catalog sheets, maintenance manuals, and approved shop drawings of all mechanical or electrical equipment controls and fixtures with all details clearly indicated, including size of lamps.
4. Names, address and telephone numbers of repair and service companies or each of the major systems installed under this contract.

B. Non-availability of operating and maintenance manuals of inaccuracies therein may be grounds for cancellation and postponement of any scheduled final inspection by the School Department until such time as the discrepancy has been corrected.

1.05 CLOSEOUT REQUIREMENTS AND SUBMITTALS

A. Final Inspection:

1. The general contractor shall submit written certification that:
   a) Project has been inspected for compliance with contract documents and has satisfied the Building Department and local Fire Department.
   b) Project has been inspected by the roof system manufacturer for compliance with contract documents and warranty. The manufacturer shall provide a roof inspection report verifying that all work has been completed to their satisfaction.
   c) Project is completed, and ready for final inspection.

2. Building Department Use and Occupancy Permit:
   a) Arrange for a final inspection and secure the signed Certificate of Inspection for Use and Occupancy from the Building Department.
3. Items to be provided but not limited to in the Close-Out Document Submission
   a) Full complete schedule of material and documents(TABLE OF CONTENTS)
   b) Record drawings (Two hard copy and one electronic copy).
   c) Workmanship, material and labor warranties for all trades.
   d) Manufacturer's warranties for all materials
   e) O and M manuals for all materials and equipment.
   f) Record copy of all approved submittals (3 record hard copies and one electronic copy).
   g) Certified letter stating continuance of insurance for period of workmanship warranty.
   h) Letter from Contractor that all punch lists have been completed per the contract documents.
   i) Consent of Surety
   j) Lien releases from all trades, distributors and contractors.
   k) Manufacturer's field reports and punch lists warranty acceptance.
   l) Final accounting of schedule of values and changes to the contract.
   m) Statement of Wage Rate Compliance

1.06 GUARANTEES AND WARRANTIES

A. Submit to the Architect all extended guarantees and warranties that have been specified in various, individual sections of the specifications. All workmanship, material and labor warranties shall be a **minimum of two years** from the accepted approved date of substantial completion for all work. Manufacturer warranties shall be described as specified with in each section of the specifications.

END OF SECTION

SECTION 01 73 00

EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Examination of existing conditions and acceptance of conditions.
B. Project preparation.
C. Execution of the Work.
D. Cleaning.
E. Protecting installed work.

1.2 RELATED SECTIONS

A. Section 01 52 40 Demolition and Construction Waste Management: Special administrative and procedural requirements for the Project waste management and recycling activities

1.3 EXAMINATION OF AND ACCEPTANCE OF EXISTING CONDITIONS

A. The General Contractor, its subcontractors and Sub Contractors shall inform themselves of existing conditions before submitting his bid, and shall be fully responsible for carrying out all work required to completely and properly execute the work of the Contract, regardless of the conditions encountered in the actual work. No claim for extra compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed, except those conditions described in the General Conditions.

B. Prior to commencement of selective demolition work, inspect areas in which work will be performed. Photograph existing damage to structure surfaces, equipment, or to surrounding properties which could be misconstrued as damage resulting from selective demolition work; file with Architect prior to starting work.

1.4 PROTECTION OF ADJACENT ELEMENTS

A. Protect installed Work and provide special protection where called for in individual specification Sections.

B. Protect existing facilities and adjacent properties from damage from construction and demolition operations. Provide temporary and removable protection for installed products and occupied areas.

C. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials. Coordinate with requirements under individual specification sections.

D. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from

waterproofing or roofing material manufacturer.

E. Protect all existing landscape areas not indicated to be cleared. Do not deface, injure, or destroy trees or other plant life. Do not remove or cut trees or other plant life, without authorization from the Owner. Do not attach any anchorages, ropes, cables or guys to any trees scheduled to remain.

1. Prohibit traffic from landscaped areas.

F. Protect non-owned vehicles, stored materials, site and structures from damage.

G. Refer to respective Sections for other particular protection requirements.

1.5 EXECUTION REQUIREMENTS FOR INSTALLATION, APPLICATION AND ERECTION

A. Inspection of conditions: The Installer of each component shall inspect the substrate and conditions under which Work is performed. Do not proceed until unsatisfactory conditions have been corrected.

B. Resource Efficiency of Materials:

1. Use construction practices such as material reduction and dimensional planning that maximize efficient use of resources and materials.
   a. Recheck measurements and dimensions, before starting installation.
2. Provide materials that utilize recycled content to maximum degree possible without being detrimental to product performance or indoor air quality.
3. Where possible and feasible, provide for non-destructive removal and re-use of materials after their service life in this building.

C. Manufacturer's instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that they are more stringent than requirements in Contract Documents.

D. Inspect material immediately upon delivery and again prior to installation Reject damaged and defective items.

E. Install each component during weather conditions and project status that will ensure the best results. Isolate each part from incompatible material as necessary to prevent deterioration.

F. Coordinate temporary enclosures with inspections and tests, to minimize uncovering completed construction for that purpose.

G. Limiting exposures: Supervise operations to ensure that no part of construction, completed or in progress, is subject to harmful or deleterious exposure. Such exposures include:

1. Excessive static or dynamic loading.

2. Excessive internal or external pressures.
3. Excessive weathering.
4. Excessively high or low temperatures or humidity.
5. Air contamination or pollution.
6. Water or ice.
7. Chemicals or solvents.
8. Heavy traffic, soiling, staining and corrosion.
9. Rodent and insect infestation.
10. Unusual wear or other misuse.
11. Contact between incompatible materials.
12. Theft or vandalism.

H. Provide attachment and connection devices and methods necessary for securing each construction element. Secure each construction element true to line and level. Allow for expansion and building movement.

I. Visual effects: Provide uniform joint widths in exposed Work. Arrange joints to obtain the best effect. Refer questionable choices to the Architect for decision.

J. Mounting heights: Where mounting heights are not indicated, review heights with Architect, prior to commencement of Work.

K. Cleaning and protection: During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

L. Clean and maintain completed construction as often as necessary through the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

1.6 PROGRESS CLEANING AND DISPOSAL OF WASTE MATERIALS

A. General: Maintain site in a clean and orderly condition. Maintain work and surrounding areas free of waste materials, debris, and rubbish; remove from site on a on-going basis through-out the term of construction.

1. Adjacent Areas: Keep adjacent areas, neighboring properties, public ways, and all nearby areas clean and free of construction debris and dirt including windblown debris.
2. Trade Contractors are responsible for cleanup and removal of their own rubbish, debris, shipping materials and waste materials through-out the term of their work.

B. Control accumulation of waste materials and rubbish; periodically dispose of off- site. The Construction Manager shall bear all costs, including fees resulting from such disposal.

C. Clean interior areas prior to start of finish work and maintain areas free of dust and other contaminants during finishing operations.

D. Maintain project in accordance with all local, Commonwealth of Massachusetts, and Federal Regulatory Requirements.

E. Store volatile wastes in covered metal containers, and remove from premises daily.

F. Prevent accumulation of wastes which create hazardous conditions.

G. Provide adequate ventilation during use of volatile or noxious substances.

1. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
2. Broom and vacuum clean areas prior to start of surface finishing, and continue cleaning to eliminate dust.

H. Use only those materials which will not create hazards to health or property and which will not damage surfaces.

I. Use only those cleaning materials and methods recommended by manufacturer of surface material to be cleaned.

J. Execute cleaning to ensure that the buildings, the sites, and adjacent properties are maintained free from accumulations of waste materials and rubbish and windblown debris, resulting from construction operations.

K. Provide on-site containers (dumpsters) for collection and containment of, waste materials, debris and rubbish.

1. Trash Barrels and Containers: Use containers with tightly fitting lids. Use only steel containers and lids when there is any evidence of rodent or pest activity.
2. Returnables: Provide special, labeled containers for deposit returnables such as soda cans.

L. Remove waste materials, debris, and rubbish from site at least once weekly, and dispose off-site. Comply with NFPA 241 for removal of combustible waste.

M. Handle material in a controlled manner with as few handlings as possible. Do not drop or throw materials from heights.

N. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not damage surrounding surfaces.

1.7 SITE MAINTENANCE AND CLEANING

A. Maintain traffic and parking areas in a sound condition, free of excavated material, construction equipment, products, mud, snow, and ice.

1. Provide means of removing mud from vehicle wheels before entering public streets and Owner’s parking areas and access.

B. Maintain existing and permanent paved areas used for construction.

1. If any street or private way shall be rendered unsafe by the Construction Managers operations, the Construction Manager shall make such repairs or provide such temporary ways or guards as shall be acceptable to the governing authority.
2. Promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

1.8 FINAL CLEANING

A. Scheduling: Perform final cleaning immediately prior to the Architect's review of the project for issue of the Certificate of Substantial Completion.

1. Re-clean all surfaces, materials and products of the Work immediately prior to Owner's occupancy of the Project.
   a. Should the Owner occupy any portion of the Work prior to completion of the Contract, the responsibilities for interim and final cleaning shall be in accordance with the General Conditions.

B. Qualifications: Commercial cleaning firm, with a minimum of 3 years experience specializing in the post-construction cleaning of facilities.

C. Protection: During the operation of final cleaning, protect surrounding materials and finishes against undue damage by the exercise of reasonable care and precautions. Clean, or repair all products and surfaces which are soiled or otherwise damaged by Work of this Section, to match original profiles and finishes. Materials and finishes which cannot be cleaned or repaired shall be removed and replaced with new work in conformance with the Contract Documents.

D. General cleaning requirements:

1. Control accumulation of waste materials and trash. Recycle or dispose of off- site at intervals approved by the Owner and in compliance with waste management procedures specified in Section 01 74 19 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.
2. Remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste.
3. Remove all advertising matter and temporary instructional material from exposed surfaces throughout.
4. Use only methods and cleaning materials which are compatible with and as recommended by the manufacturer of the material being cleaned.
5. Finished surfaces: Remove paint smears, spots, marks, dirt, mud and dust and similar disfigurement created by the Work, from all exposed to view existing or new interior and exterior finished surfaces.
6. Polished surfaces: Apply the polish recommended by the manufacturer of the material being polished.
7. Cleaning Materials: Only non-hazardous cleaning materials shall be

used in the final cleanup.

E. Exterior building surfaces:

1. Visually inspect exterior surfaces and remove all traces of soil, waste materials, smudges, and other foreign matter.
2. Remove all traces of splashed materials from adjacent surfaces.
3. If necessary to achieve a uniform degree of cleanliness, hose down the exterior of the structure.
4. In the event of stubborn stains not removable with water, the Architect may require light sandblasting or other cleaning at no additional cost to the Owner.
5. Concrete: Clean exposed concrete free of all foreign matter. If, in the opinion of the Architect, further cleaning of specific areas is required, they shall be scrubbed with water or other cleaning agents. Acid cleaners shall not be used, except as may otherwise specifically permitted in the trade sections.

F. Bright metal: Clean metal surfaces, hardware, fixtures, appliances, equipment, and similar items free of all foreign matter. As required, lightly scrub specific stains with clean water, mild soap, and soft rags, thoroughly rinsed and wiped with clean, soft white rags. Do not use abrasive cleaners.

G. Glass: Replace broken, chipped and defective glass. Remove from glass: stains, spots, marks, paint smears; dirt and foreign materials. Clean and polish both surfaces of all interior and exterior glass. Clean and polish mirrors.

H. Hardware: Clean and polish finished hardware, remove marks, stains, scratches and blemishes.

I. Tile: Clean and polish floor and wall tile, remove grout film and excess grout.

J. Woodwork: Dust and clean architectural woodwork and finish woodwork items, remove all stains, spots, and foreign matter using methods and cleaning agents which will not harm the various finishes.

K. Site: Sweep exterior paved surfaces broom clean; rake clean unpaved surfaces.

L. Equipment: Thoroughly clean all items of mechanical and electrical equipment; remove excess oils and grease from exposed surfaces.

1. Clean permanent filters and replace disposable filters if ventilating units were operated during construction.
2. Clean ducts, blowers and coils, if units were operated without filters during construction.

1.9 PROTECTING INSTALLED WORK

A. Floor and Finished Surfaces Protection: After installation, provide coverings to protect products from damage due to traffic and construction operations. Replace protective coverings which may become wet, torn, or ineffective.

Remove coverings when no longer needed.

1. Save plastic covering. At completion of Project, reuse if practical; if not, then recycle if local market exists.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. Examination of as built conditions and acceptance of conditions.

B. Administrative and procedural requirements for cutting and patching, including attendant excavation and backfill as required to complete the Work. General Contractor is responsible for coordinating all cutting and patching work, including but not limited to:

1. Cutting, altering, patching, and fitting of the Work as necessary for the proper completion of the Work. Fully integrated with all construction, all cutting, alterations and patching, to present the visual appearance of an entire, completed, and unified project.
   a. Make all products and their components of the work fit together properly.
2. Coordinate all openings in elements of the Work, and the patching of same, for penetrations required by all trades, including but not limited to mechanical, plumbing, fire protection and electrical work.
   a. Individual filed subcontractor trades are responsible for designated types of coring and drilling penetrations for piping, conduit, ducts and other penetrations as defined in this Section.
   b. Dimensional responsibilities:
      1) Mechanical, electrical, plumbing and fire protection cutting, coring, patching and sleeving of all openings up to and including 16 inches in diameter in both directions, horizontal and vertical, in walls, constructed of both masonry and gypsum drywall. In floors, the individual filed subcontractor trades are responsible for coring and sleeving up to and including 16 inches in diameter. The filed subcontractor's failure to properly coordinate coring of openings larger than those indicated herein during the construction of any wall or partition will result in the filed subcontractor trades assuming responsibility for the cost of cutting, sleeving and patching of openings provided by the General Contractor.
      2) The General Contractor is responsible for all coring that exceeds the dimensions indicated above except for uncoordinated or ill- timed work as indicated above.
3. Uncover work to provide for installing, inspecting, or both, of ill-timed work;
4. Remove and replace work not conforming to requirements of the Contract Documents or as otherwise determined to be defective.
5. Patch and match all surfaces and products disturbed or damaged by the Work.
6. Remove samples of installed work as specified for testing.
7. Infill floor openings where MEP & FP has been abandoned from openings.

1.2 RELATED REQUIREMENTS

A. Individual product specification Sections:

1. Cutting and patching of not-exposed-to-view materials incidental to work of the Section.
2. Core drilling of interior building components, incidental to work of individual Sections and as defined herein.
3. Cutting and patching work of particular exposed-to-view finish work, performed by trades as specified herein.

1.3 SUBMITTALS

A. Submit written proposals to perform cutting and patching under provisions of Section 01 33 24 – ELECTRONIC SUBMITTAL PROCEDURES. Describe cutting and patching procedures in advance of the time cutting and patching.

1. Submit a written request when cutting work affects the following:
   a. Structural integrity of any element in the project.
   b. Integrity of weather-exposed or moisture-resistant elements.
   c. Integrity of any fire suppression, fire alarm, or life safety system.
   d. Interruption or disturbance of utilities service. List utilities that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
   e. Efficiency, maintenance, or safety of operational elements and systems.
   f. Aesthetic and visual qualities of exposed-to-view elements.
   g. Efficiency, operational life, maintenance, or safety of operational elements.
   h. Work of Owner or work performed under separate Contract.
2. Include in the request:
   a. Identification of project.
   b. Location and description of affected work.
   c. Necessity for cutting or alteration.
   d. Alternatives to cutting and patching.
   e. Scope of proposed cutting, patching, alteration or excavation.
   f. List of tradespeople who will execute the work.
   g. Description of products to be used.
   h. Extent of refinishing and cleaning to be performed.
   i. Effect on work by Owner or work performed under separate Contract, and written permission of affected party.
   j. Date and time cutting and patching is scheduled to be executed.
   k. Cost proposal, when applicable.
   l. Written permission of separate Construction Manager(s) whose work will be affected.

3. Review by the Architect does not waive the Architect's right to later require complete removal and replacement of Work found to be unsatisfactory.
4. Should conditions of Work or the schedule indicate a change of products from original installation, General Contractor shall submit a request for substitution in accordance with Section 01 33 00 Submittals

1.4 QUALITY ASSURANCE

A. Only tradespersons skilled and experienced in cutting and patching shall perform such Work.

B. In performing Work which requires cutting, fixing, or patching, Construction Manager shall oversee and ensure filed subcontractor trade (s) and subcontractors utilize best efforts to protect and preserve the visual appearance and aesthetics of the Project to the reasonable satisfaction of both Owner and Architect.

1.5 PERFORMANCE REQUIREMENTS

A. General performance requirements: Execute work by methods to avoid damage to other Work, and which shall provide appropriate surfaces to receive patching and finishing.

B. Structural elements: Do not cut and patch structural elements in a manner that would reduce the load-carrying capacity or load deflection ratio. Always obtain written approval of the cutting and patching proposal before cutting and patching structural elements.
1. Do not drill through structural beams, slabs or columns. Core drilling through concrete block walls and stair platforms must be approved by the Architect.
2. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure.

C. Exposed elements:
1. Employ original installer of new construction to perform cutting and patching for weather exposed and moisture resistant elements, and sight exposed surfaces.

D. Penetrating elements: Fit work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces. At penetrations of fire rated walls, partitions, ceiling or floor construction, completely seal voids with fire rated materials in accordance to applicable codes and regulations, and compatible to surrounding construction.

E. Visual requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

1. General: Restore work with new products in accordance with the requirements of the Contract Documents.
2. Engage a firm recognized and experienced in firestopping for patching of existing firestopping, smoke seals and firesafing in compliance with applicable codes and as additionally required by authorities having jurisdiction. Comply with requirements of Section 07 84 00 - FIRESTOPPING.

F. Operational and safety limitations: Do not cut and patch operating elements or safety components in a manner that would reduce their capacity to perform as intended, or would increase maintenance, or decrease operational life or safety.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:
   a. Primary operational systems and equipment.
   b. Fire resistance rated barriers and smoke
   c. barriers. Water, moisture, or vapor barriers.
   d. Membranes and flashings.
   e. Fire protection systems.
   f. Noise and vibration control elements and
   g. Control systems.
   h. Communication systems.
   i. Conveying systems.
   j. Electrical wiring systems.

1.6 WARRANTY

A. Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void existing applicable warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Patching Materials: Use patching materials identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible. Use materials whose installed performance shall equal or surpass that of the existing materials. Comply with specifications and standards for each specific product involved.

1. All materials used shall be approved by the Architect for consistency with the existing surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examination: Inspect existing conditions prior to commencing Work, including

elements subject to damage or movement during cutting and patching. After uncovering existing work, inspect conditions affecting performance of work. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

B. Layout of cutting and patching in masonry construction. After Construction Manager identifies areas requiring cutting and patching work. Masonry Trade Contractor shall indicate on walls the extent of masonry cutting work which shall be performed by the General Contractor. Necessary patching of openings shall be performed by the Masonry Trade Contractor.

3.2 PREPARATION

A. Protection:

1. Provide temporary supports to ensure structural integrity of the Work.
2. Protect existing construction during cutting and patching to prevent damage.
3. Provide protection from adverse weather conditions.
4. Provide protection from elements for areas which may be exposed by uncovering work.

3.3 GENERAL CUTTING AND PATCHING

A. Performance: Execute work by methods to avoid damage to other Work, and which shall provide appropriate surfaces to receive repairs, patching, and finishing.

B. Execute cutting, fitting, and patching, including excavation and fill, to complete the work.

1. Cut rigid materials using masonry saw or core drill. Pneumatic tools are not permitted without prior approval, from Architect
2. Fit products together, to integrate with other work.
3. Uncover work to install ill-timed work.
4. Remove and replace defective or non-conforming work.
5. Remove samples of installed work for testing, when requested.
6. Provide openings in the work for penetration of mechanical and electrical work.

C. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining construction. Where possible, review proposed procedures with the original Installer; comply with the original Installer's recommendations.

1. In general, where cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
3. Cut through concrete and masonry using a cutting machine, such

as a Carborundum saw or a diamond-core drill.

4. Comply with requirements of applicable Division 31 - EARTHWORK Sections where cutting and patching requires excavating and backfilling.

3.4 FINISHING OF PATCHED AREAS:

A. General: Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break; for assemblies, refinish entire unit.

1. Patching: Patch with durable seams that are as invisible as possible, showing no evidence of patching and refinishing. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction Comply with specified tolerances.

a. At penetrations of fire rated walls, partitions, ceiling or floor construction, completely seal voids with fire rated materials in accordance to applicable codes and regulations, and compatible to surrounding construction.

b. Fit work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces. Provide vapor and air seal when penetrating existing vapor and air seals.

c. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.

2. Where removing walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, extend final paint coat over entire unbroken surface containing the patch after the area has received primer and second coat. Extend re-painting to entire surface plane up to where plane changes direction.

3. Patch, repair, or rehang existing ceilings as necessary to provide an even- plane surface of uniform appearance.

3.5 CORING AND DRILLING

A. Coring and Drilling of holes incidental to work of individual sections shall be performed by the trade requiring the penetration, except as follows:

1. Coring and Drilling of holes greater than 16 inches in diameter in concrete decks and slabs.

2. The General Contractor is responsible for coordinating core drilling in wall and roof surfaces leading to, or from, the outside of the Building.

3. The General Contractor is responsible for coordination of all coring and drilling and resultant patches necessary for the completion of this Contract and for the quality and appearance of all patch Work in exposed-to-view finished materials.

3.6 CLEANING

A. Cleaning patched areas: Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove paint, mortar, oils, putty and similar items.

END OF SECTION

Section 01 77 00

CLOSEOUT PROCEDURES

1.1 SUMMARY

A. Closeout of incomplete work (punch list) requirements.

B. Closeout procedures.

C. Conferences occurring after Substantial Completion.

1.2 RELATED REQUIREMENTS

A. Section 01 78 00 - CLOSEOUT SUBMITTALS: Requirements for project record documents.

1.3 PUNCH LIST REQUIREMENTS AND PROCEDURES

A. Definitions:

1. General Contractor's Punch List: Complete list of incomplete and incorrect Work prepared by the General Contractor prior to request of Architect's inspection for Certification of Substantial Completion. As a minimum the List shall include the following information for each work item:
    a. Clear identification of each incomplete work item, including all subcontractor's work.
    b. Estimated value of each incomplete work item.
    c. A short statement of why work is not complete.
    d. Identify subcontract responsibility, as appropriate to each item.
2. Architect's Punch List: A list of incomplete and incorrect Work prepared by the Architect, which modifies the General Contractor's Punch List, following review and acceptance of the General Contractor's Punch List.

B. Pre-Closeout requirements: Prior to requesting initial Architect's inspection for Certification of Substantial Completion, submit to the Architect a full and complete list of all incomplete work items (General Contractor's Punch List).

C. Punch list procedures at Substantial Completion:

1. Architect will review submitted General Contractor's Punch List and determine whether it is suitable to proceed with the Substantial Completion Process.
    a. If the Architect determines that the amount of completed work is insufficient to be considered for Substantial Completion, the Architect will not proceed with the Punch lists process until sufficient completion of the Project is achieved.
    b. The Architect will review the General Contractor's Punch List and if the Architect determines that it does not reflect proper identification of the incomplete and incorrect work, he/she will request revision and resubmission of the General Contractor's Punch List.
    c. If the Architect determines that the amount of work indicated on the General Contractor's Punch List is excessive, the Architect will suspend its review until the scope of Work identified in the General Contractor's Punch is reduced to a level satisfactory to the Architect.

d. When the Architect reviews and accepts the General Contractor's Punch List as being an accurate reflection of incomplete and incorrect work; the Architect will prepare and issue to the General Contractor the "Architect's Punch List".
   1) The Architect's Punch List will be based on the General Contractor's Punch List with modifications and additions as may be required.
   2) The Architect's Punch List includes Work which must be completed and corrected prior to Final Completion.

2. Upon receipt of the Architect's Punch List, the General Contractor shall immediately distribute the list to all subcontractors.

D. Completion of Punch List Work: Make reasonable efforts to ensure that all "Architect's Punch List" items are completed or corrected within 14 calendar days from the date of the Architect's Punch List" or within the Contract Time, whichever is earlier.

E. Architect's Final Inspection and review of Punch List Work:

1. After General Contractor certification that all punch list Work has been properly completed the Architect will then perform the Final Inspection.
   a. Incomplete Items: If the Architect discovers any incomplete or incorrect "Architect's Punch List" items or any other deficiency in the work, the Architect will prepare a "Revised Punch List" which may also include other incomplete Contract requirements such as record documents, owner's operation and maintenance manuals, warranties, and other Contract requirements. Architect's site reviews of the Work for this "Revised Punch List" and any subsequent revised Punch Lists shall be performed as additional service to Owner, back-charged to the General Contractor.
   b. The Architect may assign a dollar value for each item of incomplete or incorrect work remaining.

1.4 CLOSEOUT PROCEDURES - SUBSTANTIAL COMPLETION

A. Prior to requesting inspection for certification of Substantial Completion, complete the following:

1. On Application for Payment, show 100 percent completion for portions of work claimed as substantially complete.
   a. Submit list of incomplete items (Punch List), value of incomplete work, and reasons work is not complete.
2. Obtain evidence of compliance with requirements of governmental agencies having jurisdiction including, but not necessarily limited to:
   a. Certificate of Final Inspections, "signed off" by authorities having jurisdiction.
3. Remove temporary facilities and services that are no longer required.
4. Complete Final Cleaning, including repair and restoration, or replacement of damaged Work.
5. Remove surplus materials, rubbish and similar elements.
6. Application for reduction of retainage.
7. Consent of Surety.
8. Advise the Owner of the change-over in security provisions.
9. Notification of shifting insurance coverage.
10. Final progress photographs.

B. Within 2 weeks after receipt of the notice of Substantial Completion from the General Contractor, the Architect will inspect to determine status of completion.
   1. Should the Architect determine that the Work is not substantially complete:
      a. The Architect will notify the General Contractor in writing, stating the reasons therefore.
      b. The General Contractor shall remedy the deficiencies and send a second written notice of Substantial Completion to the Architect, requesting re-inspection.

C. When the Architect concurs that the Work is substantially complete:
   1. The Architect will prepare AIA Document G 704 - CERTIFICATE OF SUBSTANTIAL COMPLETION, in accordance with the requirements of the GENERAL CONDITIONS and SUPPLEMENTARY CONDITIONS, accompanied by the General Contractor's list of items to be completed or corrected, as verified by the Architect.
   2. The Architect will submit the Certificate to the Owner, and to the General Contractor, for their written acceptance of the responsibilities assigned to them in the Certificate.

1.5 CLOSEOUT PROCEDURES - FINAL ACCEPTANCE

A. Prior to requesting inspection for certification of Final Acceptance and final payment, perform the following:
   1. Completion of incomplete Work. Submit a copy of the final inspection list stating that each item has been completed or otherwise resolved for acceptance.
   2. Prove that all taxes, fees and similar legal obligations have been paid.
   3. Submit final payment requests with release of all liens, and supporting documentation.
   4. Provide written assurances that all unsettled claims are in the process of and will be resolved.
   5. Submit updated final statement, including accounting for final additional changes to the Contract Sum. Show additional Contract Sum, additions and deductions, previous Change Orders, total adjusted Contract Sum, previous payments and Contract Sum due.
   6. Submit consent of surety to Final Payment.
   7. Submit evidence of continuing insurance coverage complying with insurance requirements.
   8. Remove remaining temporary facilities and services.
   9. Deliver to Owner and obtain receipts for:
      a. Pest Control Inspection Report.
   10. Submit Certification stating Work has been inspected for compliance with the Contract Documents.
   11. Submit Certification stating that Work is 100 percent complete and ready for final inspection.

B. Within 2 weeks after receipt of the request for Final Acceptance from the General Contractor, the Architect will inspect to determine status of completion.
   1. Should the Architect determine that the Work is incomplete or defective:

a. The Architect will notify the General Contractor in writing, stating the reasons listing the incomplete or defective work.

b. The General Contractor shall take immediate steps to remedy the deficiencies and send a second written notice of request for Final Acceptance to the Architect.

c. Costs relative to the Architects re-inspection due to failure of Work to comply with claims made by the General Contractor, will be compensated by the Owner, who will deduct the amount of such compensation from the Final Payment due to the General Contractor.

C. After the Architect finds the Work acceptable, the Architect will review the Final Close-out submittals.

D. Application for Final Payment: Submit Application for Final Payment in accordance with procedures and requirements of the General Conditions and Supplementary Conditions.

1. The Architect will prepare a Final Change Order, reflecting approved adjustments to the Contract Sum not previously made by other Change Orders.

1.6 CONFERENCES AFTER SUBSTANTIAL COMPLETION

A. The Owner reserves the right to call for conferences commencing with the date of Substantial Completion and continuing for one year thereafter, for purposes of inspecting the Work and to plan correction of any deficiencies or failures discovered during this period.

1. Attendance is required by General Contractor's Project Manager, Architect, Owner's Project Manager and each applicator, installer, and supplier as the Owner may direct or the General Contractor may wish to have present. All representatives attending such meetings shall be the same persons, or shall have the same powers and authority, as those attending progress meetings occurring prior to the Date of Substantial Completion.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 78 00
CLOSEOUT SUBMITTALS

1.1 SECTION INCLUDES

A. Project record documents.

B. Record Project Manual.

C. Project Record Drawings (As built drawings).

D. Operation and maintenance data, preventive maintenance instructions.

E. Materials and finishes manual.

F. Product warranties and bonds.

G. Maintenance contracts.

H. Spare parts and maintenance materials.

1.2 RELATED SECTIONS

A. Section 01 71 00 Closeout Procedures
   1. Coordination Drawings Requirements an d Record As-builts

1.3 PROJECT RECORD DOCUMENT

A. General: Record documents shall reflect actual “as-built” condition and the products installed. Include all changes and deviations from original Contract Documents, and incorporate information from:
   1. Original Contract Documents.
   2. Addenda.
   3. Change orders.
   4. Construction change directives.
   5. Field directives, and instructions from the Owner, Architect or regulatory authorities having jurisdiction.

B. Project Record Documents include, but are not limited to:
   1. Record Project Manual.
   2. Project record drawings (as-builts).
   3. Operation and maintenance data, preventive maintenance instructions.
   4. Materials and finishes manual.
   5. Product warranties and bonds.
   6. Maintenance contracts.
   7. Record of all test reports and inspections.
   8. Wall charts and data such as valve diagrams, electrical panel board directories, and similar information.

9. List of all attic stock, spare parts, maintenance and extra materials turned over to the Owner. List shall be organized and sorted by specification section, and have fields for product description and quantity. A separate list shall be provided for each school building and include items from the General Contractor, Filed Subcontractors and their respective sub-subcontractors.

C. Labeling and identification of Record Documents

1. Clearly label all record documents with name of Project and the words “Record Document”.
2. Date progressive entries of information as appropriate.
3. Date Record Documents with the final submission date.

1.4 SUBMITTAL QUANTITY REQUIREMENTS

A. Furnish Architect with the following quantities of each submittal:

1. Record Project Manual: 4 bound copies.
2. Project record drawings (as built drawings):
   a. 2 sets of Drawings in Autodesk Revit (version 2015) and Autocad MEP (version 2015) format.
   b. 2 “blackline print” sets of Drawings.
3. Final Site Survey: 4 copies.
4. Operation and maintenance data, preventive maintenance instructions: 4 bound copies.
5. Owner Training Video for operation of building systems and major equipment.: 2 copies.
6. Materials and finishes manual: 2 bound copies.
7. Product warranties and bonds: 2 copies
8. Maintenance contracts: 2 copies
9. Record of all test reports and inspections: 4 copies.

1.5 RECORD PROJECT MANUAL

A. The General Contractor is responsible to maintain a Project Manual reflecting revisions and changes to the Original Issue Project Manual.

1. Clearly label the Record Project Manual as “Record Document Specifications, in a three ring binder.
2. Do not use Record Project Manual for construction purposes; protect from loss in a secure location.
3. Record all variations and deviations to the Contract Documents, including changes made by Addenda, Bulletin, Change Order, Change Directive and other modifications to the Contract.
   a. Cut and paste revisions into their applicable specification section.
   b. Identify all changes with cross-reference to appropriate Addendum Number, Modification Number, Change Order Number.
4. In each individual Specification Section, under “*Part 2 – Products*”, identify all manufacturers and products which are actually used as part of the Work.

5. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

B. Record Project Manual: Provide prior to request for Final Acceptance.

1. Manuals shall be in 8-1/2 by 11 inch pages and bound in 3-ring (D-shape) binders with durable plastic covers. Internally subdivide the binder contents by Division with permanent page dividers.
2. Label front cover and spine of each binder with laser printed titles, dates, and project information.
3. All information from “in-progress” manual shall be clearly and completely transferred.
4. Pages shall be undamaged.

1.6 PROJECT RECORD DRAWINGS

A. The General Contractor is responsible to maintain a clean, undamaged set of prints of Contract Drawings and shop drawings for preparing the record drawings.

1. Where shop drawings are used, record a cross-reference at the corresponding location on the Contract Documents.

B. Do not use Record Documents for construction purposes; protect from loss in a secure location. Mark-up these drawings to show clearly and completely the actual installation reflecting all changes made in the Work during construction.

1. Mark whichever drawing is most capable of showing conditions accurately.
2. Record all variations and deviations to the Contract Documents, including changes made to schedules, details, and all architectural changes to structure, exterior enclosure, interior partitions and ceilings.
3. Record new information that is important to the Owner, but was not shown on the Contract Drawings or shop drawings.
4. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

C. The Architect may periodically inspect these record drawings, and their proper maintenance may be a condition precedent to approval of applications for periodic payments.

D. Deliver all Project Record Documents, shop drawings, product data, and samples to the Architect for the Owner’s use, upon completion of the Work and prior to request for Final Acceptance of the Work.

E. In addition at the completion of the work, the General Contractor shall be responsible for the preparation of neat, clean, and complete electronic file of record drawings in AutoCAD format, at no additional costs to the Owner. The Architect shall assist this process by providing the General Contractor with electronic AutoCAD files of all required drawings as they appeared when released as bid documents, and including revisions to reflect addenda, architect’s supplemental instructions, and change orders processed by the Architect. The General Contractor will be responsible for making ANY OTHER revisions to these drawings which are required to reflect the as-built construction conditions and any adjustments made during the completion and coordination of construction. This shall include but not be limited to adjustments which occur as a result of the fire protection, plumbing, mechanical, or electrical coordination drawing process. The General Contractor

shall deliver these electronic AutoCAD record drawings to the Architect for review and approval at project substantial completion.

1.7 OPERATION AND MAINTENANCE MANUALS

A. General: Coordinate content and submission requirements of operation and maintenance manuals with Owner's Commissioning Agent.

B. Prepare data in the form of an instructional manual. Furnish separate manuals for each of the following groups of equipment:
   1. Special equipment and systems.
   2. Fire protection system.
   3. Utilities and plumbing systems.
   4. Electrical systems.

C. Furnish bound and properly identified Manuals prior to request for Final Acceptance.
   1. Manuals shall be in 8-1/2 by 11 inch pages and bound in three "D ring" capacity binders with durable plastic covers. Internally subdivide the binder contents with permanent page dividers.
      a. Arrange content by section number and systems, process flow, under section numbers and sequence as listed in the Table of Contents of this Project Manual.
      b. Drawings: Preferable 11 inches in height bound in with text with reinforced punched binder tab. Fold drawings larger than 8-1/2 by 11 inches to size of text pages. Provide a drawing pocket for Drawings larger than 11 by 17 inches; locate pocket inside rear cover or bound in with text.
   2. Each manual shall include the same following minimum information:
      a. Table of Contents.
      b. Directory of General Contractor, subcontractors, and major equipment supplies listing addresses, phone numbers and appropriate emergency phone numbers.
         1) Include local sources of supplies and replacement parts.
      c. Directory of Architect and consultants listing addresses and phone numbers.
      d. Operation and maintenance instructions. Provide schematic diagrams of control systems, circuit directories for each electric panel and charts showing the tagging of all valves.
      e. Air and water test and balancing reports.
      f. Maintenance and cleaning instructions for finishes.
      g. Product and manufacturer's Certificates.
      h. Photocopies of all extended warranties and bonds.
   3. Submit one copy of completed volume in final form 21 days prior to Final Inspection. This copy will be returned after final inspection with Architect's comments; Revise and submit all volumes to Owner.

D. For each item of equipment, include description of equipment, component parts and accessories. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

E. Standards:

1. Measurements: Provide all measurements in U.S. standard units such as feet and inches, pounds, and cfm; provide additional measurements in the "International System of Units" (SI).
2. Abbreviations: Provide complete nomenclature of all parts of all equipment; include part numbers of all replaceable parts.

1.8 MATERIALS AND FINISHES MANUAL

A. Furnish bound and properly identified manuals for all materials and finishes prior to request for Substantial Completion review.
   1. Manuals shall be in 8-1/2 by 11 inch pages and bound in three “D ring” capacity binders with durable plastic covers. Internally subdivide the binder contents with permanent page dividers and logically organized.
   2. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.
      a. Arrange content by section number and systems, process flow, under section numbers and sequence as listed in the Table of Contents of this Project Manual.
      b. Drawings: Preferable 11 inches in height bound in with text with reinforced punched binder tab. Fold drawings larger than 8-1/2 by 11 inches to size of text pages. Provide a drawing pocket for Drawings larger than 11 by 17 inches larger drawings; locate pocket inside rear cover or bound in with text.

B. Manuals shall include the following:
   1. Product data, with catalog number, size, composition, and color and texture designations for all building products, applied materials, and finishes. Provide information for re-ordering custom manufactured products.
   2. Instructions for care and maintenance: Include manufacturer’s recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
   3. Moisture protection and weather exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
   4. Additional requirements: As specified in individual specification Sections.

1.9 PRODUCT WARRANTIES AND BONDS

A. Categories of Specific Warranties: Warranties on the work are in several categories, including those of General Conditions, and including (but not necessarily limited to) the following specific categories related to individual units of work specified in sections of Divisions 2 through 16 of these Specifications:
   1. Special Project Warranty (Guaranty): A warranty specifically written and signed by General Contractor for a defined portion of the work; and, where required, countersigned by subcontractor, installer, manufacturer or other entity engaged by General Contractor.
   2. Specified Product Warranty: A warranty which is required by Contract Documents, to be provided for a manufactured product incorporated into the work; regardless of whether manufacturer has published a similar warranty without regard for specific incorporation of product into the work, or has written and executed a special project warranty as a direct result of Contract Document requirements.

3. Coincidental Product Warranty: A warranty not specifically required by Contract Documents (other than as specified in this Section), but which is available on a product incorporated into the work, by virtue of the fact that manufacturer or product has published warranty in connection with purchases and use of product without regard for specific applications except as otherwise limited by terms of warranty.

B. Commencement of Warranties: All warranties shall commence no sooner than the Date of Substantial Completion of the Project, except as explicitly specified otherwise in individual Specification Sections.

1. Equipment and systems start-up, operation and use, occurring prior to Project Substantial Completion, will not be considered commencement of warranty period under any terms of this Contract.

C. Refer to individual sections of Divisions 2 through 16 for the determination of units of work which are required to be specifically or individually warranted, and for the specific requirements and terms of those warranties (or guarantees).

D. General Limitations: It is recognized that specific warranties are intended primarily to protect Owner against failure of the work to perform, and against deficient, defective, and faulty materials and workmanship, regardless of sources. Except as otherwise indicated, specific warranties do not cover failures in the work which result from: 1) Unusual and abnormal phenomena of the elements, 2) The Owner's misuse, maltreatment or improper maintenance of the work, 3) Vandalism after time of substantial completion, or 4) Insurrection or acts of aggression, including war.

1. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the General Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the General Contractor.

E. Related Damages and Losses: In connection with General Contractor's correction of warranted work which has failed, remove and replace other work of project which has been damaged as a result of such failure, or must be removed and replaced to provide access for correction of warranted work.

1. Consequential Damages: Except as otherwise indicated or required by governing regulations, special project warranties and product warranties are not extended to cover damage to building contents (other than work of Contract) which occurs as a result of failure of warranted work.

F. Reinstatement of Warranty Period: Except as otherwise indicated, when work covered by a special project warranty or product warranty has failed and has been corrected by replacement or restoration, reinstate warranty by written endorsement for the following time period, starting on date of acceptance of replaced or restored work.

1. A period of time ending upon date original warranty would have expired if there had been no failure, but not less than half of original warranty period of time.

G. Replacement Cost, Obligations: Except as otherwise indicated, costs of replacing or restoring failing warranted units or products is General Contractor's obligation, without regard for whether Owner has already benefited from use through a portion of anticipated useful service lives.

H. Rejection of Warranties: Owner reserves the right, at time of substantial completion or thereafter, to reject coincidental product warranties submitted by General Contractor, which

in opinion of Owner tend to detract from or confuse interpretation of requirements of Contract Documents.

I. General Contractor's Procurement Obligations: Do not purchase, subcontract for, or allow others to purchase or sub-subcontract for material or units of work for project where a special project warranty, certification or similar commitment is required, until it has been determined that entities required to countersign such commitments are willing to do so.

J. Specific Warranty Forms: Where a special project warranty (guaranty) or specified product warranty is required, prepare a written document to contain terms and appropriate identification, ready for execution by required parties. Submit draft to Owner (through Architect) for approval prior to final executions.

1.10 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification Sections.

B. Deliver materials to on-site location designated by the Owner; obtain receipt.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

End of Section

SECTION 02 41 19
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 General Conditions, Supplementary conditions and applicable part of Division 1 form a part of this Specification and the Contractor shall consult them in detail for instructions.

1.02 The Drawings on which this contract is based are listed in Section 00 86 00. Consult all Drawings, note all conditions that may affect the Work and care for same in executing the Contract.

1.03 The Contractor under this Section shall provide all materials, labor, equipment and appliances required to do all the selective demolition, removal and related Work necessary for the proper completion of the operations as required by the Contract Documents.

A. The work of this section includes, but is not limited to, the following:

1. Complete controlled, selective demolition and removal from the site of all existing construction, materials and systems as need to properly complete the work of this Contract.

2. Careful removal and storage of items designated on the Drawings to be reused or re-installed.

3. Provision of the following temporary structures:

a. To protect from damage, all adjacent structures, building finishes, and equipment not indicated to be demolished or removed.

b. To support utilities which are currently supported by structures which are indicated to be demolished or removed.

c. To protect from dust, noise, and weather infiltration, all portions of the building that will remain occupied.

d. Coordination of Subcontractors demolition with the disconnecting, cutting, capping and rerouting of utilities.

4. Legal removal and disposal of fluorescent lamps and light ballasts.

1.04 Related Work by Others:

A. Section 22 00 00 Plumbing: Roof drain replacement, plumbing roof vent extensions

B. Section 23 00 00 HVAC: HVAC demolition and disposal is to be performed by HVAC

C. Section 26 00 00 Electrical: Extension on Electrical raceways and conduit

1.05 Related Section

A. Section 02 83 33 Demolition of Materials Bearing Lead Paint

B. Section 04 01 20 Masonry

C. Section 09 51 00 Acoustical Tile

1.06 Existing Conditions

A. This Contractor shall accept the premises in their present condition.

B. Prior to the commencement of any work under this Contract, this Contractor shall visit the site, examine the conditions there and thoroughly acquaint themselves with its obstacles and advantages for performing the Work. Contractor shall also study the Drawings explanatory of the Contract and compare same with the information gathered by the examination of the site, as no additional charge will be allowed for Work caused by unfamiliarity with the site and the Drawings.

C. Occupancy: Areas to be demolished will be unoccupied prior to start of work, but portions of the building will remain occupied and in full operation.

D. Condition of Structures: The Owner and Architect assume no responsibility nor make any claim as to the actual condition or structural adequacy of any existing construction to be demolished and the Contractor shall take all precautions to ensure safety of persons and property.

E. Traffic: Do not close or obstruct traffic ways, corridors, streets, walks or other used facilities without the written permission of the Owner and authorities having jurisdiction.

PART 2 - PRODUCTS

2.01 Materials and Products

A. Other temporary structures for shoring shall conform to all state, local and federal codes, and regulations.

PART 3 - EXECUTION

3.01 Demolition

A. All work shall be done in accordance with the governing laws and building code, and all necessary permits required for the selective demolition work shall be procured by the Contractor. Provide unobstructed legal exits at all times.

B. The selective demolition of all portions of the building to be removed shall be done with utmost care, using appropriate and safe tools and methods to assure that the building structures are not damaged. All possible care shall be taken to avoid overloading or damaging shock or vibration to portions of existing building which are to remain. All possible care shall be taken to prevent damage to existing materials and finishes which are to remain.

C. Do not begin demolition work until all dust and protective barriers, and temporary shoring have been installed.

D. Repair all damage done to elements of building to remain. Repairs shall be done in such manner as to closely match construction, appearance, and quality of original work.

E. Items to be Reused: All existing items specified or designated on Drawings to be reused on the work shall be carefully removed in a manner to assure that least possible damage results. After removal, the items shall be stored in protected storage areas within the work areas of the building for alter distribution to the various trades responsible for the refurbishing and/or re-installation of same.

F. Debris shall not be allowed to accumulate and shall be sprinkled during handling and loading to reduce dust. All debris shall be removed from the site daily. Debris shall be carried out in containers and not passed through, or thrown from, windows or other wall openings, in no case being permitted to drop free from windows, etc.

G. Disposal: All materials removed under the selective demolition work and not called for on Drawings to be reused on the project or salvaged for Owner's use shall be disposed of legally, off-the-site, by the Contractor, who will, upon removal from the site, have the rights of salvage of the materials.

3.02 Temporary Barriers

A. Protection: The Contractor shall be fully responsible for security of the work areas of the site and for protecting their and the Owner's materials stored or otherwise located on the site.

B. The Contractor shall provide temporary barricading, overhead protection, etc., of substantial nature to protect workers, other personnel, and the public against various hazards and attendant nuisances that come about as the work progresses such as, but not necessarily limited to, falling materials, stored or stockpiled materials, etc. Comply fully with the governing laws and codes. Include substantial, well constructed, protective barriers at all work-limit lines separating Contract work areas from areas occupied by Owner.

3.03 Temporary Bracing, Shoring and Coverings, Etc.

A. The Contractor shall provide temporary bracing and coverings to protect against collapse or damage to all structures, finishes, utilities, and equipment that are to remain in place in the work areas.

3.04 Sawcutting

A. All sawcutting of masonry and concrete shall be accomplished by workers skilled in this Work with a minimum of five years experience. The name of the proposed Contractor and Work experience of the workers scheduled for the Work shall be submitted to the Architect for approval.

3.05 Noise, Dust and Pollution Control

A. All work performed under this section shall conform to the requirements of Chapter III, Section 31C and Section 142D of the General Laws, Commonwealth of Massachusetts and Rules and Regulations adopted thereto by The Commonwealth of Massachusetts Department of Public

Health, and the requirements of local noise, dust, and pollution control laws, ordinances, and regulative agencies applicable to the work.

B. Provide flameproof dust-curtaining and block or filter mechanical return air systems in a safe manner between areas of the building to prevent passage of dirt and dust. Locations and quantities of barriers and dust curtaining shall at all times be subject to Owner's approval, but such approval, or lack of inspection or approval, by the Owner, shall not be construed as relieving the Contractor of any of responsibilities.

3.06 Cleaning

A. Upon completion of demolition work, including the removal of all rubbish and debris, all exposed surfaces within the work area shall then be thoroughly cleaned.

B. Items subject to water damage shall also be cleaned. When the surfaces are non-absorptive they shall be cleaned by wiping with clean, dampened cloths followed by immediate toweling with dry cloths. Specific stains shall be removed by use of dampened cloth with detergent, then thoroughly rinsed and dried. Where surfaces are absorptive they shall be cleaned by wiping with dry cloths and/or thorough vacuuming only.

C. The intent of cleaning work is to provide surfaces which are to remain exposed in the finished work and surfaces which are to receive the work or finishes of other trades, cleaned free of all traces of dirt, grime, grease and other stains and defacements.

END OF SECTION

SECTION 02 83 33

DEMOLITION OF MATERIALS BEARING LEAD PAINT

PART 1 - GENERAL

1.01 Conditions of the Contract and applicable parts of Division 1 form a part of this Specification and the Contractor shall consult them in detail for instructions.

1.02 The Drawings on which this Contract is based are listed in Section 00 86 00. Consult all Drawings, note all conditions that may affect the Work and care for same in executing the Contract.

1.03 The Contractor under this Section shall provide all materials, labor, equipment and appliances required to do all the demolition of materials bearing lead paint and related Work necessary for the proper completion of the operations as required by the Contract Documents.

A. The Contractor shall be responsible for removal/ demolition of materials containing lead-based paint including the isolation of the work area, the control of the spread and clean-up of dust generated by this work and the strict use of worker protection.

B. The work area shall be physically isolated so that individuals other than those authorized to conduct or monitor the work shall be denied access into and immediately around the work area including stockpiling of debris.

C. The Contractor shall be responsible for strict control of dust and debris generated by the work. Disposable coverings shall be securely fastened to isolate work areas for the control of the dispersion of dust and debris and the integrity of these coverings shall be maintained until clean-up is completed. the Contractor shall be responsible for the immediate clean-up and legal disposal of dust and debris that escapes from the isolated work site. The Contractor shall be responsible for the regular clean-up and legal disposal of dust and debris generated within the isolated work area. All clean-up and disposal of lead-based paint shall follow all laws and regulations including MA 454 CMR 22.00 and EPA RRP Rule (40 CFR 745).

D. Before the application of overlays and new building materials, remove loose and flaking lead-based paint to make surfaces intact, ready for covering or replacement.

E. Worker protection, including blood lead level monitoring, protective clothing, respirators and hygiene procedures, shall be employed.

1.04 Existing Conditions

A. This Contractor shall accept the premises in their present condition.

B. Prior to the commencement of any Work under this Contract, this Contractor shall visit the site, examine the conditions there and thoroughly acquaint himself with its obstacles and advantages for performing the Work. Contractor shall also study the Drawings explanatory of the Contract and compare same with the information gathered by the examination of the site, as no additional charge will be allowed for Work caused by unfamiliarity with the site and the Drawings.

1.05 Related Sections

A. Section 02 41 19 - Selective Demolition

1.06 Contractor Responsibility

A. The Contractor shall assume full responsibility for the compliance with all federal, State and local regulations:

1. Worker safety and hygiene
2. Transportation and disposal of hazardous waste

PART 2 - PRODUCTS

2.01 Materials

A. The Contractor shall supply the following as their use is required:

1. Washing Agent: 5% solution trisodium phosphate
2. Polyethylene Sheeting: 6 mil thick in 20 ft. wide rolls and conforming to ASTM E-154, C-156, D-14B, D-2103 and D-4379.
3. Polyethylene Bagging: 6 mil. polyethylene bags designed for and labeled as containers for hazardous waste.
4. Spray Encapsulant: Spray material that encases lead paint dust particles in an adhesive matrix.
5. Spray Adhesive: To assist adhesion of duct tape
6. Duct Tape: Fabric-backed high adhesion tape
7. Vacuum Equipment: Utilizing HEPA filtration systems 99.97% effective to 0.3 microns particulate size to be the sole vacuum equipment in the work area
8. Barrier Tape: 2 in. wide, yellow, non-adhesive tape with the words "CAUTION - LEAD PAINT ABATEMENT"

2.02 Warning Signs

A. Prior to the daily beginning of work, the Contractor shall post caution signs at all approaches and the four compass edges to the work area. These signs shall read:

WARNING
LEAD PAINT REMOVAL HAZARD
NO SMOKING, EATING OR DRINKING
ENTRY AUTHORIZATION REQUIRED

ADVERTENCIA
SE REMUEVE PINTURA DE PLOMO
FAVOR NO FUMAR, COMER O TOMAR
SE REQUIERE AUTORIZACION DE ENTRADE

B. Lettering shall not be smaller than 2 inches tall and shall be posted at a sufficient distance to permit a person to read the sign and take precautionary measures to avoid exposure to lead.

2.03 Worker Protection

A. Respirators

1. Workers shall be provided with NIOSH/MSHA certified respirators equipped with HEPA filters. The respirators are to be sanitized and maintained according to the

manufacturer's specifications. NOTE: Upgrade to appropriate organic cartridges in the event of the use of caustic stripping agents.

2. Appropriate respirator selection is dependent upon the intensity of the airborne concentration of lead exposure and shall follow OSHA guidelines contained in 29 CFR 1910.1025(f) (2).

3. Respiratory compliance per task may be as follows:

a. Half-face negative pressure respirator equipped with high efficacy (HEPA) filters may be used for:

- Classing with coil stock
- Exterior component removal
- Window and frame removal
- Clean-up

b. Powered air-purifying respirator equipped with high efficacy (HEPA) filters must be used for:

- Scraping to make intact or to strip to bare wood
- Anytime airborne concentrations of lead exceed the 8 hour TWA of 2.5 mg/m3.

B. Clothing

1. Workers shall be provided with protective disposable full-body coveralls, head covering, protective eye wear or face shield, boot or shoe covers and gloves. A minimum of two changes of clothing for each worker shall be provided during an 8 hour day.

C. Safety Equipment

1. Work boots, work gloves, hard hats and safety glasses will be worn at all times. All times will be decontaminated prior to leaving abatement area. Work boots will not be taken for job site.

2.04 Decontamination/Changing

A. The Contractor shall provide a decontamination unit or changing area to be used by all abatement personnel upon entering and leaving the work area.

1. The unit shall be placed immediately adjacent to the work area and polyethylene sheeting shall be placed on the pathway leading from the work area to the decontamination unit.

2. No abatement work shall begin until the unit is in place in operating condition.

PART 3 - EXECUTION

3.01 Work Area Preparation

A. Interior Preparation

1. Interior preparation shall be performed by clean workers who are no contaminated with lead paint dust.

2. Window wall and door removal from the outside:

a. Cover floor area immediately beneath areas being removed.

b. Secure one layer of polyethylene on the interior of the window wall or door in a manner that the layer can be removed from the exterior but not interfere with the removal of the existing window wall. Seal all around with duct tape.

c. Secure another layer of polyethylene on the interior of the window wall or door to the existing floor and/or wall surrounding the window or door being removed. Seal all around with duct tape.

B. Exterior Preparation

1. Polyethylene sheeting will be secured to the exterior wall above the ground plan by means of mechanical fasteners and/or adhesives. The sheeting will extend out from the building for the remainder of the 20 feet roll of sheeting and from the window or door opening or railing 20 feet in each direction covering soil surfaces. Where the work area abuts a neighboring unit, the ground sheeting shall be brought up the face of the building and secured to the building face approximately coincident with the interior party wall. The outer edge of the sheeting away from the building face shall be held up by securing to staging or timber framework.

2. Plywood panels, minimum 1/2 inch thick, will be placed on top of the ground sheeting to prevent puncturing in the immediate vicinity of the specific areas being worked on. The perimeters of the sheeting will be secured to the ground surface by stakes or weights.

3. Barrier tape and warning signs shall be erected along the outer edge of the ground sheeting.

3.02 Clean-Up

A. Prompt clean-up of the flakes and dust collecting from making the surfaces intact and removing components shall be undertaken. Do not allow debris to accumulate outside of the disposal containers.

3.03 Breakdown of Coverings

A. Remove all barriers and protective sheeting and clean up at the end of each work day and promptly at the conclusion of abatement work.

1. Inspect sheeting to be sure that all loose dust, flakes and debris has been cleaned off and disposed.

2. Vacuum and remove protective plywood panels.

3. Working from the perimeter of the sheeting, fold toward the center, remove fastened edges and continue to neatly fold until sheeting can be placed in double polyethylene bags and disposed.

3.04 Disposal

A. Legally dispose of all debris according to DEP and EPA regulations.

1. Concentrated paint flakes, particles and dust shall be disposed as hazardous waste.

B. Provide to Owner receipts indicating legal disposal of debris.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 - GENERAL

1.01 General Conditions, Supplementary Conditions and applicable parts of Division 1 form a part of this Specification and the Contractor shall consult them in detail for instructions.

1.02 The Drawings on which this Contract is based are listed in Section 00 86 00. Consult all Drawings, note all conditions that may affect the Work and care for same in executing the Contract.

1.03 The Contractor under this Section shall provide all materials, labor, equipment and appliances required to do all the rough carpentry and related Work necessary for the proper completion of the operations in accordance with the intent of the Contract Documents.

The Work of this Section shall include, but not be limited to, the following:

A. Temporary enclosure for openings and other temporary items, including railings, ladders and similar items required under the applicable Sections of Division 1.

B. Wood furring & blocking.

C. Wood blocking and nailers not specified under other Sections.

D. Wood preservative pressure treatment blocking for all associated roof blocking..

E. Rough hardware, including bolts, screws, spikes, nails, and clips, as required to install rough carpentry work.

F. Installation of any items specified elsewhere to be installed under this Section and those items under other Sections where installation is not specified.

G. Any other miscellaneous items of carpentry or fastening or installing of same.

H. Coordinate the rough carpentry work of this Section with the work of the various trades responsible for applying finish materials and other items to rough carpentry work. Furnish and install furring, blocking, and shims as required to make the rough carpentry surfaces acceptable to these trades.

1.04 Reference Standards, Specifications, and Codes

A. The following are hereby made a part of this Section by reference thereto:

1. American Wood Preservers Institute (AWPI) Standard C2.

2. American Wood Preservers Bureau (AWPB) Quality Mark LP2.

3. American Plywood Association (APA) Grades and Specifications.

4. National Lumber Grades Authority. American Lumber Standards and Grading Rules and Standards of the various lumber associations whose species are being used, with grademarks for same.

5. U. S. Department of Commerce Simplified Practice Recommendation R-16, for sizes and use classifications of lumber, and Product Standard PS-1, for quality of plywood.

6. National Forest Products Association National Design Specifications for Stress-Grade Lumber and Its Fastenings.

1.05 Related Sections:

A. Section 01 27 00 Unit Prices

B. Section 07 53 23 Roofing

1.06 Submittals

A. Submit the following in accordance with Section 01 33 24.

1. Specifications and product data for lumber and plywood, including fabrication process, treatments and accessories.

PART 2 - PRODUCTS

2.01 Grading Standards and Quality

A. All stress-grade lumber shall conform to the requirements of NFPA National Design Specifications for Stress-Grade Lumber and its Fastenings.

B. All lumber shall:

1. Be new, dressed four sides (S4S) clear and free from warping and other defects.

2. Have a moisture content not exceeding 19 percent when delivered to the project.

3. Be in accordance with the grading rules of the lumber manufacturer's association under whose jurisdiction the specie of lumber is produced.

C. Plywood: Conform to the requirements of Product Standard PS-1 and bear applicable APA grade trademarks.

2.02 Lumber, Plywood and Other Rough Carpentry Materials

A. Stress-grade lumber: Conform to the following or better:

B.

Member	Species/Grade No.	Minimum Allowable (p.s.i.)		
		Fb	Fc	E
Joists	Hem-Fir No. 2	1,100		1,400,000
Posts - Studs	Hem-Fir No. 1		850	1,300,000
Pressure Treated	Southern Pine No. 2	1500	850	1,400,000

C. Non-stress grade lumber. Construction, of No. 2 and Better, Grade Hem/Fir or Spruce, Grade-stamped S-Dry.

D. Plywood for panelboard mountings and similar uses: CC-Plugged Int-APA, touch-sanded.

E. Plywood sheathing for roofs and other concealed from view locations: CD-EXT-APA, in thicknesses indicated on the Drawings.

F. Treatments for Wood and Plywood:

1. Pressure preservative treatment for application to all wood sleepers in conjunction with preformed roofing; blocking, nailers, cant strips, and curbs in conjunction with roofing and roofing sheet metal work; and for wood nailers and blocking embedded in concrete and masonry: Pressure treated with a toxic salt wood preservative meeting or exceeding Federal Specification TT-W-535, Type B, applied in a closed cylinder by vacuum process, full cell method in strict accordance with the recommended practices of the American Wood Preservers Association and Federal Specification TT-W-571g, with a retention of at least 0.35 pounds of dry salts per cubic foot of wood. Re-dry all treated wood before installation.

2. Fire-retardant treatment for application to all wood framing members; plywood subflooring/underlayment; and for plywood sheathing used in conjunction with interior surfaces: Pressure fire-retardant treatment, providing a fire hazard classification of 25

Flame Spread, Smoke Developed, and Fuel Contributed, with no signs of progressive combustion when the 10-minute test is continued for an additional 20 minutes. Osmose Flame Proof LHC, Kippers Dricon, Hoover Universal Pro-Tex, or equal.

G. Bolts and Fastenings:

1. All fasteners shall be screw or bolt type fasteners. **Nail fasteners are not allowed or accepted. All screw fasteners to be countersunk and or flush with surface. No projections will be accepted.**

2. For lumber having actual thickness of 1-1/2 inches or greater to masonry and concrete: Steel anchor bolts or expansion bolts, as most applicable for the specific receiving surface material, 3/8 inch minimum diameter, spaced as shown, and staggered as far as practicable. Countersink all bolt heads, and provide head washers of matching material.

3. For lumber having actual thickness of greater than 7/8 inch but less than 1-1/2 inches to masonry and concrete: Steel anchor bolts or expansion bolts, as most applicable for the specific receiving surface material, at least 1/4 inch diameter of the most appropriate lengths for the specific application, spaced as shown, and staggered as far as practicable. Countersink all bolt heads, and provide head washers of matching material.

4. For lumber having actual thickness of 7/8 inch and less: Steel anchor bolts or expansion bolts, at least 1/4 inch in diameter, or screws, of the most appropriate sizes; in lengths most suitable for the specific application, countersunk, spaced as shown, and staggered as far as practicable. Provide head washer of matching material.

5. All bolts embedded into concrete or masonry shall be hot-dipped galvanized.

PART 3 - EXECUTION

3.01 Storage of Materials

A. Store all materials in an elevated dry location, protected by waterproof coverings. Do not store within the building until masonry, concrete and other such wet work has been completed and allowed to dry.

3.02 Temporary Bracing

A. Provide and maintain, until such time as permanently built into the structure, all temporary bracing for pressed steel frames, sills, and other work requiring bracing and which is not specified as being provided under other Sections of the Specifications.

3.03 Protection

A. Do such work as is necessary to cover and protect all finishes and other work from damage during construction. Provide and maintain temporary substantial wood handrails around all openings through floors, and provide temporary traffic-supporting coverings for roof openings until permanent items are installed thereover.

3.04 Temporary Enclosures

A. Furnish, install and maintain in weatherproof condition until permanent enclosure items are installed, substantial temporary enclosures of weatherproof construction for all openings in the exterior walls of the building, as required to provide proper installation conditions for all trades engaged in the work. Remove temporary enclosures only when permanent enclosures will be immediately installed thereafter.

3.05 Runways and Ladders

A. Furnish set, and maintain runways and ladders, leading from the lowest point of the building to the roofs, and serving conveniently onto each floor for the general use of all workmen.

B. Ensure that temporary ladders are of sufficient length and in a position to permit the top end to project not less than three feet above the floor, wall or other surface against which it is placed.

3.06 General Installation of Rough Carpentry Work

A. Closely coordinate the installation of the rough carpentry work with the work of other trades responsible for the installation of interfacing or overlaying materials, so as not to delay the work of the related trades.

B. Erect all rough carpentry work plumb, level, and true with tight, close fitting joints, securely attached and braced to surrounding construction, all in a first class workmanlike manner. Counterbore for bolt heads, nuts, and washers where required to avoid interference with other materials. Bear complete responsibility for structural integrity, connections, and anchorage of all rough carpentry work.

C. Use as long lengths as practicable for wood nailers, blockings, and curbs, to minimize number of joints, and attach the members with the types, and spacings, of fasteners specified herein.

D. Fastening of nailers, blocking and other rough lumber. Pre-drill and counterbore all number at fastener locations. Install nailers and blocking with specified fastenings equipped with large washers, and space the fasteners not more than 18 inches on centers, and stagger lines of fasteners for all lumber having a width greater than 3-1/2 inches. Use not less than two fasteners per piece of lumber. **Ensure that no part of the fastener or nuts extend beyond the top surface of the lumber.** Install wood shims, as needed to ensure completely true surfaces. Miter all intersecting corners of lumber, and fit all adjacent running pieces with tight ends. After making cuts in treated lumber, and prior to the placement thereof, brush on a heavy coat of the specified preservative to the cut ends.

E. Install wood grounds and furring as required for proper attachment of the work of other trades in accordance with the requirements provided by the respective related trades.

3.07 Clean-Up

A. Upon completion of rough carpentry work in any given area, remove all rubbish and debris from the work area and leave in broom clean condition.

END OF SECTION

SECTION 07 53 23

ROOFING (ADHERED EPDM ROOF SYSTEM)

PART 1 - GENERAL

1.01 General Conditions, Supplementary Conditions and applicable parts of Division 1 form a part of this Specification and the Contractor shall consult them in detail for instructions.

1.02 The Drawings on which this Contract is based are listed in Section 00 86 00. Consult all Drawings, note all conditions that may affect the Work and care for same in executing the Contract.

1.03 The Work to be performed under this Section shall include furnishing all labor, materials and equipment required to install the single ply roofing and related Work as shown on the Drawings or herein specified.

Summary - Include the following:

A. The existing PVC roof assembly is to remain where indicated. Where the existing PVC roof system is to remain, the existing roof membrane is to be cut away from all roof edges and terminations, provide 3/4" diameter holes in membrane every 100 SF. A new mechanically fastened cover board and adhered EPDM membrane system is to be installed over the existing roof assembly.

B. Full roof removal and replacement with adhered insulation and adhered EPDM membrane where indicated.

C. Water test and verify free flow at all drains in the work areas prior to beginning work. Snake all roof drains minimum 100 linear ft. down from the roof storm drain openings at both pre-construction and at post construction of the project.

D. Water flood test at completion of project, 24 hour period for all drain sumps extending 2 feet beyond edge of sump, conforming to ASTM 5957.

E. Provide infrared survey and report of existing roof system in determination of wet insulation in coordination with Section 01 27 00 Unit Prices

F. Cutting away of existing roof assembly from roof edges and terminations. Providing cuttings and penetrations in existing PVC roof system to address entrapment of moisture / vapors. The contractor shall be aware that the existing roof system is adhered PVC with rigid insulation as indicated on the drawings.

G. 10 Field / perimeter test cuts of existing roof system to confirm existing built assembly with photo report of found conditions

H. Removal of existing roofing system package where indicated. See drawings as described.

I. Legal disposal of all debris. Provide necessary dumpsters and bill of lading.

J. New Vapor Barrier.

K. New mechanically and adhesive fastened insulation and cover board where indicated.

L. New tapered insulation, crickets, diverters where indicated.

M. FM-1-49 Pull Tests at existing perimeter blocking at 50 feet intervals prior to commencement of work.

N. Direct adhered EPDM membrane where indicated. There will be two colors used, black on all the flat roofs and white on the pitched octagon roof.

O. New metal edge strips, fascias and copings.

P. New Wood blocking and nailers associated with the roofing where indicated.

Q. New flashings and repair of existing metal flashings to remain.

R. Roof Walkway Traffic Pads.

S. Ballasted Roof Guard Rails

T. New roof scuttle / hatch with extension pole

U. Provide all new pressure treated lumber sleepers to all mechanical units.

V. Infrared survey of newly installed roof system, 60 days after substantial completion.

W. Staging, hoisting and related support for the performance of the work.

X. The contractor shall carry 4000 square feet replacement of existing wet 5 inch thick insulation and 1/8" taper insulation in base bid, See Section 01 27 00 Unit Prices

Y. Perimeter / curb existing wood blocking replacement. Contractor to carry 200 linear feet of blocking, reference details 7,8,9 / A3.1, See Section 01 27 00 Unit Prices

Z. Roof drain replacement, See Section 01 27 00 Unit Prices

1.04 Every detail and condition is not specifically illustrated by a detail Drawing. It is the intent of this Section, however, that every part of the reroofing and repair Work be completed in a manner to present a finished, watertight product equal in quality to details shown and specified and so approved by the Architect.

1.05 Shop Drawings

A. Submit the following in accordance with Section 01 33 24:

1. Shop Drawings shall include outline of roof and size, location and type of penetration, perimeter and penetration details and special details.

B. Shop Drawings shall also show full size details of flashings, gravel stops, fascias, expansion joints, fittings, curbs, parapet flashings and other metal Work.

1.06 Submittals

A. Submit for approval samples, detailed shop drawings and manufacturer's specifications of the following materials in accordance with applicable requirements under Section 01 33 00:

1. Membrane and flashings (all types)
2. Roof Walkway Traffic pads
3. Bonding adhesive, splicing cement, lap sealant and related materials supplied by the membrane manufacturer
4. Vapor Barrier
5. Rigid insulation, taper insulation layout and cover board
6. Aluminum edge fascia, trim and all metal work.
7. Wood blocking, nailers and plywood
8. Fasteners (All Types)
9. Warranty Type and Period.

10. Roof Manufacturer's assembly letter confirming design will meet specified wind speeds and warranty requirements.
11. Piping, Couplings and fittings
12. Anchors, Guides and Supports including Seismic Restraints.

1.07 Related Sections

A. Section 01 27 00 - Unit Pricing
B. Section 02 41 19 - Selective Demolition
C. Section 06 10 00 – Rough Carpentry
D. Section 07 62 00 – Sheet Metal Flashings, Gutters and Trim
E. Section 07 92 00 – Joint Sealants

1.08 Acceptance of Installation Conditions

A. This Contractor shall be fully responsible for the proper execution and performance of the Work described herein.

1.09 Quality Assurance -Roofing

A. Inspection: Upon completion of the single ply roofing installation, an inspection shall be made by a representative of the roofing manufacturer to ascertain that the roofing system has been installed according to the manufacturer's specifications and details.
B. The Roofing System must achieve a UL **Class A**.
C. The specified roofing assembly must have been *successfully tested* by a qualified testing agency to resist the design uplift pressures calculated according to:

ANSI/SPRI WD-1 "Wind Design Standard Practice for Roofing Assemblies"

American Society of Civil Engineers (ASCE 7)

International Building Code (IBC) as amended and adopted by the current Massachusetts Building code.

However, for *required fastening patterns*, the roofing system design and installation shall be installed to meet the fastening pattern attachment requirements of Factory Mutual **1-90, 74 MPH,** including the prescriptive enhancements at all perimeter and corner conditions.

Design Uplift Ratings

Field	-21.2 psf
Perimeter	-38.5 psf
Corners	-53.4 psf

Rigid insulation and cover-board shall be fastened to the deck as indicated using approved fasteners and adhesives. Attachment shall be at a **minimum** and may be increased per the manufacturer requirements:

Adhesive Fastened:	Field	4 inch ribbons O.C.
	Perimeter	4 inch ribbons O.C.
	Corner	4 inch ribbons O.C.

Mechanical Fastened:

Field	16 Fasteners per 4'x8' sheet
Perimeter	16 Fasteners per 4'x8' sheet
Corner	24 Fasteners per 4'x8' sheet

and as approved by the membrane manufacturer and the Architect to comply with the terms of the specified warranty and wind speed. Fasteners shall be as approved by the manufacturer.

1.10 Product, Delivery, Storage and Handling

A. Deliver materials in original unopened containers.

B. Containers shall be labeled with manufacturer's name, brand name, installation instructions and identification of various items.

C. Store materials, except membrane, in dry area and protect. Damaged materials shall be replaced at Contractor's expense.

D. Store materials, except membrane, between 60 degrees F and 80 degrees F. If exposed to lower temperatures, restore to proper temperatures before using.

1.11 Job Conditions

A. Do not use oil base or plastic roof cement.

B. Do not allow waste products (petroleum, grease, oil, solvents, vegetable or mineral oil, animal fat) or direct steam venting to come in contact with single ply roofing system.

C. Do not expose membrane and accessories to a constant temperature in excess of 180 degrees F.

D. Do not breathe cement and bonding adhesive vapors or use near fire.

E. Membrane splice wash used in the splicing procedure is extremely flammable; do not use near fire or flame or in a confined area. Dispense only from a UL listed or approved safety can.

F. Splicing and bonding surfaces shall be dry and clean.

G. Material Safety Data Sheets (MSDS) must be on location at all times during the transportation, storage and application of materials.

H. When positioning membrane sheets, exercise care to locate all field splices away from low spots and out of drain sumps. All field splices should be shingled to prevent bucking of water.

I. When loading materials onto the roof, the Contractor must comply with the requirements of the building owner to prevent overloading and possible disturbance to the building structure.

J. If single ply roofing system is installed in cold temperatures, follow specified precautions for storage of materials and expose only enough cement and adhesive to be used within a four (4) hour period. No installation procedure that involves adhesives or bonding shall take place when the temperature is below 25 degrees F.

K. Roof surface shall be free of ponded water, ice or snow.

1.12 Guarantee-Warranty

A. This Contractor shall furnish a written warranty stating that all Work executed under this Section will be free from defects of material and workmanship for a period of two (2) year from the date of final acceptance by the Owner. The Contractor/Manufacturer shall also furnish a **Twenty (20) year manufacturers' warranty equal to the Carlisle "Golden Seal"** warranty for the "Total Roofing System" including but not limited to metal trim, metal flashings and metal fascias. The maximum wind speed coverage shall be peak gusts of **74 mph, measured at 10 meters** above ground level. Certification is required with bid submittal indicating the manufacturer has reviewed and agreed to such wind coverage.

   The Total Roofing System is defined as the following materials: Membrane, Flashings, Counterflashings, Adhesives and Sealants, Insulation, Recovery Board, Fasteners, Fastener Plates, Fastener Strips, Metal Edging, Metal Termination Bars, and any other products utilized in this installation.

B. This Contractor further states that he will, at his own expense, repair and replace all such defective materials or workmanship and all other Work damaged thereby which is so damaged during the **two (2) year warranty period.** The roofing manufacturer will, at his own expense, repair and replace all defective materials and workmanship covered by their warranty and will repair any leak for the **Twenty (20) year warranty period.**

C. The manufacturer shall also furnish a written warranty stating that the membrane material will not prematurely deteriorate to the point of failure because of weathering for a period of thirty (30) years.

D. Pro-rated System Warranties shall not be accepted.

E. Evidence of the manufacturer's warranty reserve shall be included as part of the project submittals for the specifier's approval.

PART 2 - PRODUCTS

2.01 Single Ply EPDM Membrane - Directly Adhered

A. Furnish the rubber membrane roofing system as manufactured by the Carlisle Tire and Rubber Co., Carlisle, PA, Versigard Co. Inc., Firestone Rubber Co. Inc., or approved equal as indicated on the Drawings and specified in the Contract Documents.

B. For the purpose of establishing a standard of quality only, this Specification has been written using the material requirements and installation procedure for fully adhered established by the Carlisle Tire and Rubber Co.

C. All materials used in the roofing system shall be as furnished by the manufacturer selected.

   1. The membrane shall be Sure-Seal 0.060 inch thick, maximum ten feet wide, length determined by job conditions, EPDM (Ethylene Propylene Diene Monomer) compound elastomer conforming to the following minimum physical properties. The membrane shall conform to the minimum physical properties of ASTM D4637.

Property	Test Method	Specification
Color Grey/Black/White		
Tolerance on Nominal Thickness, %	ASTM D 412	+/-10
Tensile Strength Min. PSI	ASTM D 412	1305

Elongation, Ultimate Min, %	ASTM D 412	350
Tear Resistance Min, LBF/In (Die C)	ASTM D 624	175
Factory Seam Strength Min ASTM D 816	Modified Rupture	Membrane
Resistance to Heat Aging	ASTM D 573	
Properties after 4 weeks @ 240°F		
Tensile strength min. psi	ASTM D 412	1200
Elongation, ultimate min,%	ASTM D 412	225
Tear Resistance Min. lbf/in	ASTM D 624	150
Linear dimensional change max,%	ASTM D 1204	+/-2
Ozone Resistance		
Condition after exposure to 100pphm Ozone in air for 168 h @ 104°F Specimen is at 50% strain	ASTM D 1149	No Cracks
Brittleness Temperature Max.		
degrees	ASTM D 746	-75
Resistance to Water Absorption	ASTM D 471	
Change in mass max, after 7d immersion @ 158°F, %		4
Water Vapor Permeability max, perm-mils	ASTM E 96 (Proc B or BW)	2.0
Resistance to Outdoor (Ultraviolet)		
Weathering Properties after Langleys EMMAQUA: 50% strain, calendar sheeting		
Tensile strength min, psi	ASTM D 412	1200
Elongation min, %	ASTM D 412	225
Sheet Composition	ASTM D 297	
Weight percent of polymer that is EPDM, min, %		100
Weight percent of sheet that is EPDM polymer, min, %		30

2. Flashing shall be minimum 0.060 inches thick, furnished by membrane manufacturer.
3. Bonding adhesive shall be as furnished by the membrane manufacturer shall be compatible with all materials to which the membrane is to be bonded.
4. Lap sealant for sealing the exposed edge of the splices shall be trowel or gun consistency as furnished by the membrane manufacturer.
5. Splice Tape: Sure-Seal SecurTAPE and primer as furnished by the manufacturer.
6. Water cutoff mastic shall be as furnished by the membrane manufacturer.

7. Prefabricated accessories (pipe seals, etc.) shall be as furnished by the membrane manufacturer.

8. Temporary sealant shall be as furnished by the membrane manufacturer.

9. Pitch Pocket: 20 year warranty detail with stainless steel rain hood. Detail U-16C, with extra layer of Pressure Sensitive Elastoform Flashing extending min. 3 inches beyond the base layer of flashing for 20 year warranty. Pourable sealer shall be compatible with materials with which it is used, furnished by membrane manufacturer.

10. Securement Strips and Fasteners: 0.045 inch reinforced securement strips and fasteners furnished by membrane manufacturer.

11. Splice Wash shall be furnished by membrane manufacturer.

2.02 Rigid Thermal Insulation and Cover Board – Minimum R Value = 31.2 at full replacement areas

A. Rigid insulations shall be Sure-Seal Polyisocyanurate HP H Polyiso insulation as manufactured by Carlisle. Panels have polyisocyanurate foam core and are faced with glass fiber reinforced felt facers meeting ASTM C 1289-06, Type II, Class 1, Grade 3 (25 psi). Panels shall be 4 feet x 8 feet. Thickness of insulation shall be as indicated.

B. Tapered insulation shall be HP-H Tapered POLYISO rigid insulation as manufactured by Carlisle. Panels have polyisocyanurate foam core and are faced with glass fiber reinforced felt facers meeting ASTM C 1289-06, Type II, Class 1, Grade 3 (25 psi). **Panels shall be 4 feet x 4 feet.** Thickness of insulation shall be as indicated.

C. Tapered sumps at roof drains and tapered roof crickets.

D. Cover Board: High Density Cover Board shall be high density , closed cell polyisocyanurate foam core laminated to coated-glass fiber-mat facer as manufactured Carlisle SecurShield HD Plus, 1/2” thick, 4’ x 8’ / 4’ x 4’ panels, weight 11 lbs with an R-value of 2.5.

E. Underlayment Board: High Density Cover Board shall be high density , closed cell polyisocyanurate foam core laminated to coated-glass fiber-mat facer as manufactured Carlisle SecurShield HD Plus, 1/2” thick, 4’ x 4’ panel, weight 11 lbs with an R-value of 2.5.

2.03 ADHESIVES, CLEANERS AND SEALANTS

A. Low VOC Bonding Adhesive: A low VOC (volatile organic compound) bonding adhesive (less than 250 grams/liter) used for bonding Sure-Seal/Sure-White EPDM membranes to various surfaces. Available in 5 gallon pails.

B. Sure-Seal SecurTAPE™: A 6" wide (used for Mechanically Fastened Roofing Systems and 30-year Warranty Systems) by 100' long splice tape used for splicing adjoining sections of EPDM membrane. Complies with the South Coast Air Quality Management District Rule 1168.

C. Low VOC EPDM Primer - A low VOC (volatile organic compound) primer (less than 250 grams/liter) for use with SecurTape or Pressure-Sensitive products.

D. CAV-GRIP Low VOC Primer - A low VOC (Volatile Organic Compound) primer for use with Carlisle 725 TR Air and Vapor Barrier and FAST Adhesive. Primer to be used on surface of existing roof deck for adherence ½ inch underlayment with FAST Adhesive and as a primer for the adherence of the Carlisle 725 TR Air & Vapor Barrier to the top of the ½ inch underlayment.

E. Pourable Sealer: A black, two-component, solvent-free, polyurethane based product used for tie-ins and as a sealant around hard-to-flash membrane penetrating objects such as clusters of pipes and for a daily seal when the completion of flashings and terminations cannot be completed by the end of each work day.

2.04 Metal Ballast Stop, Fascia Extenders and Fascias, Edge Strips, Scuppers

Furnish the metal trim and edge system as manufactured by the Carlisle Tire and Rubber Co., Carlisle, PA, Metal ERA Inc., Firestone Rubber Co. Inc., or approved equal as indicated on the Drawings and specified in the Contract Documents.

A. General: All metal edgings shall be tested and meet ANSI/SPRI ES-1 standards and comply with International Building Code.

B. Metal ballast stop, edge strip/fascia, scuppers and related metal work shall be SecurEdge One Extened Fascia, .050 inch prefinished aluminum in color as selected with extend fascia extender (1 piece), as manufactured by Carlisle. Full range of colors including Standard and Premium colors.

C. SecurEdge Coping: Incorporates a 20 gauge anchor cleat with 4 pre-slotted holes, a concealed joint cover and 10 foot continuous sections of coping cap; can accommodate minimum 5 “ wide parapet walls. Metal coping cap color shall be as designated by the Owner's Representative.

D. Termination Bar: A 1” wide and .098” thick extruded aluminum bar pre-punched 6” on center; incorporates a sealant ledge to support Lap Sealant and provide increased stability for membrane terminations.

E. Provide all accessories necessary for a complete installation including factory-fabricated corners, concealed corner plates, corners and related items.

F. Color shall be selected from manufacturer’s full range of colors including premium colors.

2.05 Vapor Barrier

A. Carlisle 725TR Air & Vapor Barrier / Temporary Roof: 725TR is a 40-mil composite consisting of 35-mils of self-adhering rubberized asphalt factory laminated to a 5-mil polyethylene film with an adhesion textured surface. 725TR roll dimensions are 39” x 75’ and the product is applied after priming an acceptable substrate with CCW 702, 702-LV or Cav-Grip primer.

2.06 Wood Blocking and Plywood

A. All lumber used for blocking, nailers and fascias, etc. shall be new and in good sound condition of nominal sizes, as indicated on the Drawings, dressed 4 sides.

B. All lumber shall be preservative pressure treated with wolmanized salts, each piece shall be so labelled.

C. All plywood used as filler pieces, etc. shall be new CD exterior grade plywood. Plywood shall be in good sound conditions of sizes and thicknesses as indicated on the Drawings.

D. All perimeter blocking shall be fastened and anchored in accordance with FM 1-49.

Nailer and Blocking Installation:

1. Nailers shall be anchored to resist a minimum force of 300 pounds per lineal foot

(4,500 Newtons per lineal meter) in any direction. Individual nailer lengths shall not be less than 3 feet (0.9 meter) long. Nailer fastener spacing shall be at 12 inches on center or 16 inches (0.4 m) on center if necessary to match the structural framing. Fasteners shall be staggered 1/3 the nailer width and installed within 6 inches (0.15 m) of each end. Two fasteners shall be installed at ends of nailer.lengths. Nailer attachment shall also meet the requirements of the current Factory Mutual Loss Prevention Data Sheet 1-49.

2. Install continuous wood nailers at the perimeter of the entire roof and around roof projections and penetrations as shown on the Detail Drawings. Existing nailers that are to remain in place shall be firmly anchored in place to resist a minimum force of 300 pounds per lineal foot (4,500 Newtons per lineal meter) in any direction and shall be free of rot, excess moisture or deterioration. Only woodwork shown to be reused in the drawings shall be left in place. All other woodwork shall be removed.

3. The Architect shall be notified of any condition where the existing nailers to remain do not meet the pull out test meeting the requirements of FM1-49. Provide a pull-out test to confirm that existing nailers and blocking to remain meet the requirements of FM 1-49. Refer to section 01 27 00 Unit Prices for additional information.

4. Nailer and blocking thickness shall be as required to match substrate or insulation height to allow a smooth transition of the membrane.

5. Provide stainless steel, corrosion resistant, fasteners when mechanically attaching roofing products to wood nailers and wood products treated with ACQ (Alkaline copper Quaternary). When ACQ treated wood is used on steel roof decks or with metal edge detailing, a separation layer must be placed between the metal and ACQ treated wood.

2.07 Sheet Copper

A. All sheet copper for repairs shall be American made; Thickness shall match existing in areas of repair.

2.08 Roof Walkway Traffic Pads

A. Protective surfacing for roof traffic shall be Sure-Seal (black). Pressure-Sensitive Walkway Pads (with Factory-Applied Tape on the underside of the walkway) adhered to the membrane surface in conjunction with Sure-Seal Primer. Walkway pads by others, when specified, must be adhered to the EPDM deck membrane with SecurTAPE/Primer.

B. Roof walkways shall be typically 2'-6" wide unless noted otherwise. Whether show or not, all roof top equipment shall have walk way pad to service area of each piece of serviceable equipment and connecting to a main circulation route originating from a roof access hatch or main access point to roof by ladder.

2.09 Fasteners

The existing roof deck consists of multiple roof type structures, refer to drawings for locations:

1. 16/16 GA Non Acoustical - Cellular Metal Deck,

2. 1. 16/16 GA Acoustical - Cellular Metal Deck,

3. 2.5” LW Concrete (Perlite) topping sloped to drains on Steel Tex or Rib Lath over Open Web Steel Joists

4. Wood planks on steel channels at canopies

A. Fasteners for blocking and insulation shall be of the screw type suggested and required by the roof membrane manufacturer in order to fulfill all requirements to obtain all manufacturers' guarantees. Nail fasteners are not permitted. The roofing contractor shall be required to arrange for "pull-out" tests as deemed necessary by the roofing membrane manufacturer in order to mechanically fasten to the existing deck. Depending on the type of existing structural, insulation will be mechanically fastened or adhesively bonded to the deck structure. Fasteners for blocking shall be a screw type fastener, no nail fasteners will be accepted.

B. HP Fasteners: A heavy duty #14 threaded fastener with a #3 phillips drive used for insulation securement into steel, wood plank or minimum 15/32 inch thick plywood.

C. Pre-Assembled ASAP Fasteners: A pre-assembled 3” diameter Plastic Plate and # 12 threaded fastener with a #3 drive used for insulation attachment into steel or wood decks. Installed using OMG Fastening Tools.

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D. HP Term Bar Nail-Ins: A 1-1/4” long expansion anchor with a zinc plated steel drive pin used for fastening the Carlisle Termination Bar or Seam Fastening Plates to concrete, brick, or block walls.

E. Seam Fastening Plate: A 2” diameter metal fastening plate used in conjunction with RUSS or EPDM membrane for additional membrane securement.

F. Polymer Seam Plate: A 2” diameter plastic fastening plate incorporating barbs on the underside of the plate. This plate is required for membrane and RUSS attachment installed in conjunction with steel roof decks. May also be used for insulation attachment.

G. Insulation Fastening Plates: A nominal 3 inch diameter plastic or metal plate used for insulation attachment.

H. Sure-Seal Pressure-Sensitive RUSS™ (Reinforced Universal Securement Strip): a 6” or 9” wide, nominal 45-mil thick clean, cured black reinforced EPDM membrane with 3”or 6” wide Factory-Applied Tape (FAT) laminated along one edge. The 6” or 9” wide Pressure-Sensitive RUSS is used horizontally or vertically at the base of walls, curbs, etc., in conjunction with 2” diameter securement plates or bars below the EPDM deck membrane for additional membrane securement.

I. Vent Pipe Penetrations:

1. Premanufactured : Pre-Molded PS Pipe Seal , 30 year warranty, 90 mil EPDM, Carlisle detail “U-8A.1. Boot to be sized to specific pipe size. **UNIVERSAL BOOT NOT ACCEPTED**

2. Field Wrapped: 30 year warranty, 90 Mil EPDM, Carlisle detail U-8B, to include all round pipes penetrations to be double wrapped with two layers of Pressure-Sensitive

Elastoform flashing, terminated with a stainless steel clamping ring 7 sealed with continuous lap sealant.

J. Insulation Adhesive:

1. FAST Adhesive: A two component insulating urethane adhesive used to attach insulation. Packaging formats include 50 and 15 gallon drums as well as Dual Cartridges and 5 gallon Bag in a Box formats.

2.10 Roof Hatch

A. Furnish and install where indicated on plans metal roof hatch Type S-50 as manufactured by the Bilco Company, New Haven, Connecticut, or approved equal. Cover shall be 11 ga. aluminum with 3 inch beaded flange, neatly welded. Insulation shall be glass fiber 1 inch thickness, fully covered and protected by a metal liner, 18 ga. aluminum. Size of the unit is 30 inches by 36 inches. Powder coat finish, color selected from manufacturers full range of colors

2.11 Ballasted Roof Guard Rails

A. Free standing, non-penetrating, OSHA compliant roof edge railing fall protection system . All material to be hot dipped galvanized with shop applied safety color paint.

Acceptable manufacturers:

1. Railguard 200 Roof Edge Rail System by Garlock Equipment Company.
2. KeeGuard Roof Fall Protection Railing by Simplified Safety
3. SafetyRail 2000 by Bluewater Manufacturers

PART 3 - EXECUTION

3.01 Work List

A. Water test roof drains prior to start of work and the completion of the new work.

B. Water flood test at completion of project, 24 hour period for all drain sumps extending 2 feet beyond edge of sump, conforming to ASTM 5957.

C. Remove existing roofing package

D. Remove existing base flashings

E. Level roof surface for acceptance of new work

F. Install Underlayment Board and Vapor Barrier

G. Install rigid insulation, cover board and crickets where indicated. Insulation thickness shall be as indicated on drawings

H. Install wood blocking.

I. Extend vent piping above finished roof as designated.

J. Apply single-ply membrane and flashings.

K. Install new pressure treated sleepers to existing mechanical units.

L. Install metal edge strips / fascias and copings.

M. Dress-down and repair or replace existing metal flashings to remain where noted.

N. Install Roof Walkway Traffic Pads.

3.02 Rigid Insulation

A. Rigid insulation and cover-board shall be fastened to the deck as indicated using approved fasteners and adhesives. Attachment shall be at a **minimum** and maybe increased per the manufacturer requirements:

Mechanical Fasteners:	Field	16 Fasteners per 4'x8' sheet
	Perimeter	24 Fasteners per 4'x8' sheet
	Corner	32 Fasteners per 4'x8' sheet
Adhesive Fastened:	Field	4 inch ribbons O.C.
	Perimeter	4 inch ribbons O.C.
	Corner	4 inch ribbons O.C.

and as approved by the membrane manufacturer and the Architect to comply with the terms of the specified warranty and wind speed. Fasteners shall be as approved by the manufacturer. Joints shall be 1/8 inch or less in width. Joints wider than 1/8 inch shall be filled with spray foam insulation. Offset joints of adjacent boards by half a board longitudinally.

3.03 Installation - Roof Nailers And Blocking

A. All fasteners shall be screw or bolt type fasteners. **Nail fasteners are not allowed or accepted.**

B. General: Provide anchorage for nailers as required for roof and edging to obtain FM 1-49 rating.

1. Secure nailers and blocking to metal deck with stainless steel screws at not greater than 12 inch on center spacing, extending a minimum of 3/4-inch below deck.
2. Secure nailers and blocking to wood substrates with stainless steel screws at not greater than 12 inch on center spacing, extending a minimum of 1-1/2 inch into board substrates and 3/4 inches into sheet materials. Nail and pin fasteners are not allowed, only screw type fasteners are acceptable.

C. When building up layers of nailers and blocking, fully secure each layer to at least the one below, alternating location of fasteners, spacing at 12 inches on center. Provide fasteners in lengths to penetrate through more than one substrate layer of blocking. Stagger locations of butt ends of boards, such that no two joints are "lined up".

D. **Ensure finished height of nailers is same as top surface (high point) of roof insulation.**

3.03 Vapor Barrier

A. Install vapor barrier without tears or punctures. Attach to air barrier membrane in wall assembly to provide complete seal, if indicated. **Vapor barrier joints / overlap to be located**

over high point of existing metal deck ribs. Rolled vapor barrier application to run parallel with deck ribs / flutes.

3.04 Direct Adhered Membrane System

A. Membrane

The single-ply direct-adhered membrane roofing system shall be applied over the rigid insulation or cover board. Installation shall be done by a Roofing Contractor approved by the membrane manufacturer.

B. Membrane Attachment

1. Position 0.090 inch membrane over approved substrate without stretching.
2. Allow membrane to relax approximately one-half hour prior to bonding.
3. Fold sheet back so that half of the underside of the sheet is exposed. Sheet fold shall be smooth without wrinkles or buckles.
4. Apply bonding adhesive evenly, without globs or puddles, with a 9 inch plastic core paint roller. Do not apply bonding adhesive to the splice area. Adhesive shall be firmly applied to both the sheet and the substrate. One (1) gallon of bonding adhesive, applied correctly, will cover 60 square feet of finished surface at moderate temperature. Allow adhesive to dry until it is tacky but will not string or stick to a dry finger touch.
5. Roll the coated membrane into the coated substrate while avoiding wrinkles.
6. Brush down bonded half of the sheet with a pushbroom to achieve maximum contact.
7. Fold back the unbonded half of the sheet and repeat the bonding procedure.
8. Install adjoining sheets in the same manner, lapping edges a minimum of 3 inches.

Note: At all inside angle changes where slope exceeds 2 inches in one horizontal foot, securement strip is required to be installed.

D. Membrane Splicing with Tape

1. General
    a. Tape splices shall be a minimum of 5 ½ inches wide using 6 inch wide SecurTAPE extending 1/8 inch minimum to ½ inch maximum beyond the splice edge. Field splices at roof drains shall be located outside the drain sump.
    b. Prior to SecurTAPE application, the splice area shall be primed with Sure-Seal low VOC Primer.
    c. Cold weather restrictions – When temperatures are below 40 degrees F (5 degrees C): Comply with manufacturers recommendations.
2. Position membrane sheet to allow for an approximate 6 inch overlap. Mark the bottom sheets with an indelible marker ½ inch from the top sheet edge. The pre-marked line on the membrane edge can also be used as a guide for positioning splice tape.
3. Apply Primer to achieve a thin, even coat on both membrane surfaces. Splice area must be uniform in color, streak-free and free of globs or puddles.
4. Allow Primer to dry until tacky but does not transfer to a dry finger touch.
5. Unroll approximately 3 feet of SecurTAPE. Align release film with marked line and press tape down to bottom sheet using firm, even, hand pressure. Continue for the length of

the splice. Tape roll ends must be overlapped 1 inch. Allow top sheet to rest on release film on back side of tape.

6. Pull release film from SecurTAPE beneath the top sheet and allow the top sheet to fall freely onto the exposed tape.

7. Press the top sheet onto the tape using firm, even hand pressure across the splice towards the splice edge.

8. Immediately roll the splice with a 2 inch wide steel roller, using positive pressure. Roll across the splice edge, not parallel to it.

9. Install a 6 inch wide section (with rounded corners) of Sure-Seal Pressure-Sensitive Flashing or Sure-Seal Elastoform Flashing over all field splice intersections and seal edges of flashing with Lap Sealant.

E. Perimeter Membrane Securement

1. Securement shall be provided at the perimeter of each roof level, roof section, curb flashing, skylight, expansion joint, etc. and at any angle change where slope exceeds 2 inches in one horizontal foot.

2. Securement shall be as follows:

a. EPDM Securement Strip (RUSS) shall be mechanically fastened through the membrane, insulation and into roof deck with approved fasteners.

b. Field membrane shall be adhered to PS RUSS strip

3.05 Roof Walkway Traffic Pads

A. Install walkway at all traffic concentration points (such as roof hatches, access doors, rooftop ladders, etc.) and all locations as identified on the drawings.

3.06 Edge Strips

B. Edge strip shall be installed and secured according to an installation detail accepted by the membrane manufacturer. Securement provided by the Contractor shall prevent buckling and prohibit metal gravel stop from pulling free.

C. Flashing of the edge strip deck flange must extend 3 inches inches minimum past the point of securement in all directions.

D. Flashing of the edge strip deck flange must provide complete coverage to the flange and provide a minimum 3 inch wide splice to the adjoining deck membrane. Use the same splice cement for sealing flashing to the membrane and to the edge strip.

E. Wood Nailer shall be installed at the edge strip perimeter of each roof level, shall be pressure treated with salt preservatives.

1. Anchor wood nailers to resist a force of 75 pounds per lineal foot in any direction. The thickness of the nailer shall be such that it conforms to the detail drawings. Any deviations from the details are to be brought to the attention and approved by the Architect.

3.07 Flashing

A. Walls, parapets, mechanical equipment, curbs, and similar conditions. Use the longest pieces of materials which are practicable. All flashings and terminations shall be done in accordance with the applicable detail, and the manufacturers latest details for the requested warranty.

1. When using flashing at a vertical surface, complete the splice between the flashing and the main roof sheet before bonding flashing to the vertical surface. The splice shall extend at least 3 inches beyond the membrane at the angle change.
2. When using a continuation of roofing membrane as flashing, bond the membrane to the surface to be flashed without "pig ears".
    a) Apply bonding adhesive evenly, without globs or puddles, with a 9 inch plastic core paint roller.
    b) Apply bonding adhesive to both the flashing and the surface to which it is being bonded at a rate covering approximately 60 square feet of finished surface per gallon.
    c) After the bonding adhesive has dried to the point that it does not string or stick to a dry finger, roll the flashing into the cemented surface. Care must be taken to ensure that the flashing does not bridge where there is a change of direction.
    d) Fasten to the top of the installed flashing under metal counterflashing or coping cap at a maximum of 12 inches on center.
    e) Then install flashing as required to form a continuous membrane seal in each corner.

3.08 Penetrations

A. General

1. Flash all penetrations passing through the membrane.
2. The flashing seal must be made directly to the penetration passing through the membrane system.
3. All existing flashing shall be removed.

B. Vent Pipes, Round Supports, etc.

1. Flash pipes with Sure-Seal molded pipe flashings where installation is possible.
2. Molded pipe flashing shall not be cut and patched; deck flanges shall not be overlapped.
3. Where molded pipe flashings cannot be installed, use field fabricated pipe seals.
4. The deck membrane must be secured with a nailer around penetrations larger than 18 inches in diameter.

C. Pitch Pockets

1. Install a new metal pitch dam at existing pitch pockets and seal with pourable sealer. New dam shall provide minimum 2 inch depth, 1 inch clearance.

D. Roof Drains

1. Remove existing flashing and cement in preparation for water cut-off Mastic and membrane seal.
2. Provide a smooth finish on the clean mating surfaces between the clamping ring and the drain base.
3. Taper insulation around drain to prevent membrane from bridging and to provide a smooth transition from roof surface to drain clamping ring.

4. The seal between the membrane and the drain base shall be provided by water cut-off mastic under constant, even compression.

5. Follow drain manufacturer's recommended installation procedures.

3.09 Surface Splice

E. Correction of splices, tears, etc. may be accomplished by splicing a membrane section over the affected area.

1. Select repair membrane which is the same material as that to be repaired.

2. Extend the repair membrane section at least 3 inches in every direction from the splice, tear, etc. to be corrected.

3. To remove field dirt, clean the splice area with soap and water, rinse with clean water, and dry.

3.10 Daily Seal

A. Care should be exercised to ensure that the water does not flow beneath any completed sections of roof. Temporarily seal loose edge of membrane with temporary seal when weather is threatening.

1. Apply the temporary seal at a rate of 100 lineal feet per gallon (on smooth surface) twelve (12) inches back from edge of sheet onto exposed substrate surface. If necessary, use a trowel to spread material in order to achieve a complete seal.

2. After embedding membrane in temporary seal, check for continuous contact. Then weight the edge, providing continuous pressure over the length of the cutoff.

3. When work is resumed, pull sheet free before continuing installation.

3.11 Installation Controls

A. No membrane work, base flashing or any part of the installation procedure that requires adhesives or bonding will be permitted with the presence of any precipitation or when the temperature is below 25 degrees F. This provision will be strictly enforced by the Owner, Owner's representative and the Architect.

B. No Work that generates excessive noise, dust or vibration which includes but is not limited to 1) removal of gravel, 2) ballast conveying operation, 3) spreading of ballast, etc., shall be executed during the period when school is in session.

3.12 Sheet Aluminum Installation

A. Anchor work in place with noncorrosive fasteners, adhesives, setting compounds, tapes and other materials and devices as recommended by manufacturer of each material or system. Provide for thermal expansion and building movements. Comply with recommendations of “Architectural Sheet Metal Manual” by SMACNA.

B. Seal moving joints in metal work with elastomeric joint sealants.

C. Clean metal surfaces of substance which could cause corrosion.

D. Water-tight/weatherproof performance of flashing and sheet metal work is required.

3.13 Sheet Copper Repair

A. All sheet copper repair work shall be performed in strict accordance with the recommended practice and standard specifications of the Copper and Brass Research Association and Copper and Common Sense as recommended by Revere Copper and Brass, Inc.

3.14 Additional Metal Repair

A. All existing metal work to remain, including existing aluminum cleats, shall be repaired and refastened as necessary. If material cannot be properly repaired or refastened as approved by the Architect, it shall be replaced with like materials.

3.15 Roof Hatch

A. Install roof hatch in accordance with manufacturer's recommendations with non-corroding, screw-type fastenings.

3.16 Cutting and Core Drilling

A. Perform all cutting and core drilling operations that are outlined in Part 1 of this SECTION. Throughout the performance of the cutting and coring work, ensure that the structural integrity
of the walls, floors, overhead structure, and other structural components, which are to remain, is maintained until permanent work is installed. Prior to any coring or cutting, verify all locations of same with the General Contractor. All cutting and coring is to be performed in accordance with approved Coordination Drawings

B. Cut all masonry and concrete with an approved diamond blade concrete saw in a neat straight
direction, perpendicular to the plane of the wall or floor.

C. Use a core drilling process which produces clean, sharp edges and the minimum hole size which will accommodate the size of pipe sleeve specified. Submit procedures for cutting thru existing steel beams to Architect for review.

D. The patching of holes shall be performed by Plumbing Sub-contractor utilizing methods outlined for the finish trade involved. Holes shall be patched to the satisfaction of the Architect.

END OF SECTION

SECTION 07 62 00

SHEET METAL FLASHING, GUTTERS AND TRIM

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

General Conditions, Supplementary Conditions and applicable parts of Division 1 form a part of this specification and the Contractor shall consult them in detail for instructions.

The drawings on which this Contract is based are listed in Section 00 86 00. Consult all drawings, note all conditions that may affect the work, and care for same executing this contract.

It is intended that all metal work shall be from same manufacturer for consistent matching colors as selected by architect. Items that are not by the same manufacture shall have custom color to match.

The Contractor under this Section shall provide all materials, labor, equipment and appliances required to do all the masonry restoration and related work including but not limited, to the following:

A. SUMMARY

Furnish and install the following:

1. Aluminum edge trim to tie in gutters to roof edge flashing trim
2. Aluminum gutters and down leaders with splash blocks / subsurface drainage transition to existing connections.
3. Cap flashings, in conjunction with roofing system sheet membrane base flashings.
4. High Temperature Self Adhering Bituminous Water Proofing membrane under all metal work
5. Formed aluminum brake-metal work.
6. Associated bond breakers for dissimilar metals.
7. Sealant in conjunction with sheet metal work specified herein.

B. Coordination with Commissioning Agent, Commissioning General Requirements and Building Enclosure Commissioning.

1.2 RELATED SECTIONS

A. Section 01 52 40 - DEMOLITION and CONSTRUCTION WASTE MANAGEMENT: Procedural and administrative requirements for construction and demolition waste disposal.

B. Section 06 10 00 - ROUGH CARPENTRY: Wood blocking, nailers.

C. Section 07 92 00 - JOINT SEALANTS: Sealant and backing material not specified herein.

D. Flashing sleeves and collars for mechanical and electrical items protruding through roofing: By respective trade sections furnishing same.

E. Section 07 53 23 Roofing (Adhered EPDM Roof System) Sheet membrane flashings for flanges of curbs, and sheet membrane roofing and flashing system.

1.3 REFERENCES

A. Comply with applicable requirements of the following standards and those others referenced in this Section. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. ASTM B 209 - Specification for Aluminum Alloy, Sheet and Plate.
2. ASTM B 221 - Specification for Aluminum Extrusions.
3. FS QQ-A-250d - Aluminum and Aluminum Alloy, Plate and Sheet.
4. ASTM A 653/A 653M - Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
5 AASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
6 ASTM B 370 - Standard Specification for Copper Sheet and Strip for Building Construction.

B. The following reference materials are hereby made a part of this Section by reference thereto:

1. SMACNA - Architectural Sheet Metal Manual 6th Edition, referred to herein as “Sheet Metal Manual”.
2. NRCA - Roofing and Waterproofing Manual.

1.4 SUBMITTALS

A. Submit the following under provisions of Section 01 33 24 – ELECTRONIC SUBMITTAL PROCEDURES:

1. Literature: Manufacturer's data sheets for each metal type and accessories furnished hereunder, include material specifications, performance data, physical properties and finishes.
2. Certification: Provide certifications that materials and systems comply with the specified requirements for the use indicated.
3. Shop drawings:
   a. Fully dimensioned large scale design details showing material

profiles, splices, flashing terminations and other jointing details, fastening methods and installation details. Indicate material type, sizes, and weights or gages. Indicate extent of adjacent work specified under other Sections of the Specifications.

b. Fully detail methods of relieving stresses due to thermal movement, including sealing of expansion seams.

c. All details bearing dimensions of actual measurements taken at the project.

4. Selection Samples:

a. Metal sample chips, indicating Manufacturer's full range of finish colors for factory finishes available for selection by Architect.

b. Manufacturer's sample boards for sealant colors.

B. Submit the following under provisions of Section 01 70 00 – CONTRACT CLOSEOUT :

1. Manufacturer’s warranties: Include coverage of materials and installation and resultant damage from failure of installation to resist penetration of moisture

1.5 MOCK-UP

A. Provide mock-up elements for field panel at exterior location where directed by Architect. Mock-up will demonstrate quality of work, construction methods, relationship to other work.

1.6 PRE- INSTALLATION CONFERENCES

A. Installer of the Work of this Section is required to attend pre-installation meeting with Owner, architect and Owner’s project manager.

1.7 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling, and Unloading: Protect finish panel faces.

B. Acceptance at Site: Examine each panel and accessory as delivered and confirm that finish is undamaged. Do not accept or install damaged panels.

C. Storage and protection:

1. Stack pre-formed material to prevent twisting, bending, and abrasions.

2. Provide ventilation.

3. Prevent contact with materials which may cause discoloration or staining.

1.8 SEQUENCING AND SCHEDULING

A. Coordinate the installation of flashings and sheet metal work with the various trades responsible for installing interfacing materials, and install the work at appropriate times so as not to delay the progress of related work.

1.9 QUALITY ASSURANNCE

A. Company specializing in fabrication and installation of sheet metal flashing work with minimum 5 years documented experience.

B. Flashing and sheet metal applicator, with a minimum of 5 years documented experience demonstrating previously successful work of the type specified herein, and approved by product manufacturer.

C. Industry Standard: Except as otherwise shown or specified, comply with applicable recommendations and details of the "Copper in Architecture" handbook published by the Copper Development Association Inc. (CDA). Conform to dimensions and profiles shown.

D. Wind Uplift: Provide roof assemblies meeting wind uplift ratings as required by code.

E. Mock-Up: Before proceeding with final purchase of materials and fabrication of copper roofing components, prepare a mock-up of work. Incorporate materials and methods of fabrication and installation identical with project requirements. Install mock-up at roof area location directed by Architect. Retain accepted mock-up as quality standard for acceptance of completed copper roofing. If accepted, mock-up may be incorporated as part of copper roofing work.

F. PRE-INSTALLATION CONFERENCE

1. Contractor shall convene two weeks prior to commencing Work of this section.
2. Ensure all contractors responsible for the roof assembly are present. Manufacturer’s representative for ridge and fascia vent system will make weekly site inspections to confirm proper installation and warranty compliance.

1.10 WARRANTY - METAL GUTTER SYSTEM

A. Manufacturer’s 10 year Standard Warranty: Warranted materials shall be free of defects in material and workmanship for five years after shipment. If, after inspection, the manufacturer agrees that materials are defective, the manufacturer shall, at their option, repair or replace them. For decorative finish warranty, consult manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS

Basis of design in regard to finish color, all aluminum components shall have same color for consistency of project. Colors shall be selected from Metal Era Standard, Premium and Express color palette. Any components not by basis of design shall have custom color to match above described color palette. There will be two colors selected from color palette, one for the fascia, gutters, down leaders, drip edge. Factory fabricated, welded fascia, shop finished to exactly match running fascia. Minimum leg length 12 inches. Fabricate assembly such that the fascia may be field installed without fastener. Fascia

shall freely thermal cycle on spring cant substrate. Penetration of either the roofing membrane or the cant water dam. Fascia may be factory modified for true radius application. Edging shall lock membrane, preventing wind pullback.

A. Aluminum flashing: FS QQ-A-250d sheet aluminum, having a minimum thickness as specified herein below, for applications where indicated:

1. Exposed to weather flashings and trim: 0.050 inch thick
2. Gutter and downleaders and brackets: 0.050 inch thick
3. Rain Diverters : 0.050 inch thick
4. Aluminum Finish:

a. Polyvinylidene Fluoride (PVDF), Kynar 500 shop applied four coat resin based, high performance thermoplastic organic coating in custom non-standard color to match Architect's sample, up to two colors shall be selected, colors shall be selected from Carlisle's Color chart, full range of colors including standard and premium colors conforming to AAMA 605.2, NAAMM - Metal Finishes Manual, and the following:

1) Resin base of 70 percent PVDF by weight, Atochem North America, Inc., product "Kynar 500" or Ausimont USA. product "Hylar 5000 ".

2) Finish Coating shall be manufactured as one of the following products:

a) Glidden Company; product "Visulure".

b) Morton International; product "Fluoroceram CL".

c) P.P.G. Industries Inc.; product "Duranar XL".

d) Valspar Corp., product: "Flurothane".

b. Surface Preparation: Properly clean aluminum with inhibited chemical cleaner and pretreat with acid chromate-fluoride-phosphate conversion coating, in accordance with Aluminum Association method AA-C12C42.

c. Primer: Corrosion resistant, epoxy or urethane based primer compatible with finish coating, averaging 0.2 to 0.3 mils dry film thickness.

d. Barrier Coat: Epoxy-based primer compatible with finish coating, averaging 0.70 to 0.80 mils dry film thickness.

e. Finish Coat (Color Coat): Polyvinylidene fluoride enamel averaging 0.70 to 0.80 mil dry film thickness.

f. Top Coat: Polyvinylidene fluoride enamel clear top coat averaging 0.45 to 0.55 mils dry film thickness.

2.2 ACCESSORIES

A. Flashing cement: Trowel grade, composed of selected asphalt, solvents, and non- asbestos fillers, conforming to FS SS-C-153 Type 1, ASTM D 2822, Type 1 and ASTM D 4586, Type 1 (Non-asbestos) as manufactured by Karnak Chemical Corporation, product Nº. 19 "Flashing Cement" , or equal as manufactured by Koch Materials Company, J & P Petroleum Products

Company or other approved manufacturer.

B. Dampproofing mastic: Trowel grade, self-priming type composed of selected asphalt, solvents, fibers and non-asbestos fillers, conforming to ASTM D 2822, Type 1 and ASTM D 4586, Type 1 (Non-asbestos) as manufactured by Karnak Chemical Corporation, product Nº. 86 “Fibrated Trowel Mastic” , or equal as manufactured by Koch Materials Company, J & P Petroleum Products Company or other approved manufacturer.

C. Bituminous Coating: SSPC-Paint 12, Cold-Applied Asphalt Mastic (Extra Thick Film), nominally free of sulfur, compounded for 15-mil dry film thickness per coat.

D. High Temperature Grade Water Barrier Underlayment: Cold applied, self-adhering membrane composed of a high density, cross laminated polyethylene film coated on one side with a layer of butyl rubber or high temperature asphalt adhesive. Provide primer when recommended by water barrier manufacturer.

1. Minimum Thickness: 30 mil.

2. Tensile Strength: ASTM D 412 (Die C Modified); 250 psi.

3. Membrane Elongation: ASTM D412 (Die C Modified); 250%.

4. Permeance (Max): ASTM E96; 0.05 Perms.

5. Acceptable Products:

   a. Blueskin PE 200 HT, Henry.

   b. Ultra, W.R. Grace Company.

   c. CCW MiraDRI WIP 300 High Temperature, Carlisle Coatings and Waterproofing.

6. FLASHING FABRICATION - GENERAL

   a. Form flashings as required, or to profiles indicated on the Drawings, to protect materials from physical damage and shed water.
   b. Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance. To the greatest extent applicable, fabricate sheet metal components in shop, and thoroughly clean all joints on both sides of the sheet metal work.
   c. Fabricate cleats and starter strips of same material as sheet.
   d. Form pieces in longest practical lengths, with flat lock seams. Hem exposed edges on underside 1/4 inch, miter and seam corners.
   e. Fabricate corners from one piece with minimum 18 inch long legs, solder for rigidity, water tight.

2.4 ALUMINUM GUTTERS AND DOWN LEADERS

A. Basis of Design: Metal Era, Inc. - Seal-Tite Gutter System: Designed to accommodate the drainage of large roof areas.
   A. Standard designs: Model # IG-B
   B. Acceptable Manufacturers:
      a. Petersen Aluminum
      b. Firestone
      c. Atlas Roofing

B. PERFORMANCE CHARACTERISTICS:
   A. Heavy gauge gutter straps securely support large volumes of water, as well as extreme snow and icing conditions.
   B. Manufactured to rigid tolerances and furnished per required drainage capacity/size.
   C. Adapts easily to “optional” drainage bars or flow through gravel stops.

C. Gutter metal gauge: .070", with Kynar 500 finish.

D. Gutter: standard 12'-0" (3.65 m) lengths.

E. Exterior gutter system finishes: Kynar 500 from manufacturer’s standard colors.

F. Corners, end caps, expansion joints or exterior brackets shall be fabricated by manufacturer. Factory fabricated, mitered corners shall have 17½" nominal leg lengths. Seal aluminum seams with epoxy metal seam cement and where required for strength, rivet seams and joints. Corners shall be shop mitered and shop welded of same material as the metal fascia and edge strips. Space expansion joints no greater than 30 feet and conceal expansion provisions.

G. Provide matching edge caps, down leaders, and other special fabrications as detailed.

H. Downspouts shall be fabricated in continuous lengths of 0.050 aluminum alloy as specified above. Downspouts shall be 5 inches by 6 inches minimum or as indicated on drawings, whichever is bigger. Seams shall be concealed where possible. Fasten to wall with 0.050 aluminum straps to match downspout at 2'-0" on center. Fold edges to avoid sharp corners and obstructions.

I. Comply with "Architectural Sheet Metal Manual" by SMACNA for each general category of work.

J. All fastenings for gutters and downspouts shall be stainless steel screw type or drilled expansion type fastenings as approved by the Architect.

K. Color shall be Kynar baked enamel to match the ballast stop/edge strip.

L. Color shall be selected from manufacturer’s full range of colors including premium colors.

2.5 SPLASH BLOCKS

A. Precast concrete splash blocks: Solid concrete, fan-shaped units, 8-1/2 inches wide at narrow end, 14 inches wide at opposite end, 23-3/4 inches long, and 2-1/4 inches thick.

B. Adhesives for traffic pads, paver units, splash blocks, and pedestals: As approved by the sheet membrane roofing material manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips and reglets in place and nailing strips located.

B. Beginning of work shall constitute acceptance of the conditions of the surfaces to which this work is to be applied.

3.2 PREPARATION

A. Clean surfaces to receive metal panel roofing and side wall panels. Substrate to be smooth and free of defects. Drive all projecting nails or other fasteners flush with substrate.

B. Water Barrier Underlayment:

1. Install high temperature grade water barrier on clean, dry roof substrate.

2. Remove dust, dirt, and loose fasteners.

3. Remove protrusions from the deck area.

4. Verify substrate has no voids, damaged, or unsupported areas.

5. Repair voids or unacceptable areas before installing membrane.

6. Prime substrates with manufacturer's approved primer if required for proper installation of membrane over substrate.

7. Install membrane in strict accordance with manufacturer's printed application procedures, precautions, and limitations.

8. Start application at low points and lap membrane shingle fashion to prevent water penetration.

9. Membrane Underlayment: Apply horizontally, lapping preceding layer not less than 4-inches (100 mm). End lap membrane not less than 6-inches (150-mm) .

   a. Maximize adhesion to substrate by brooming or rolling membrane in place after placement.

   b. Center membrane at valleys, hips, and ridges.

C. Field measure site conditions prior to fabrication.

D. Install starter and edge strips, and cleats before starting installation.

E. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.

F. Insert flashings into reglets to form tight fit. Secure in place with plastic wedges at maximum of 8 inches on center. Seal flashings into reglets with sealant.

G. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.

H. Cleat and seam all joints. Apply plastic cement compound between metal flashings and felt flashings, asphalt shingle roofing or asphalt roll roofing.

I. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

J. Seal all aluminum joints watertight.

K. During the installation of work of this Section, protect the work of other trades against undue soilage and damage by the exercise of reasonable care and precautions. Repair or replace any work so damaged and soiled.

3.3 FLASHING INSTALLATION - GENERAL

A. Except as otherwise shown on the reviewed shop drawings or specified herein, the workmanship of sheet metal work, method for forming joints anchoring, cleating, provisions for thermal movement, shall conform to the standard details and recommendations of the sheet metal producer and those of producer organizations and research institutions and associations concerning the sheet metal used, in addition to the standards and details set forth in the referenced materials specified this Section.

B. Face nailing will not be permitted, concealed cleating or other concealed

method must be used to attach sheet metal work to structure.

C. Ensure that fastenings do not exceed 8 inches on centers. Use flat head fasteners throughout, and seal all fastener heads after installation thereof.

D. Fill all slip joints and overlapping surfaces in the assembly with specified sealant material, removing all excess sealant material from the prefinished surfaces immediately, to prevent staining the finish.

E. Install continuous vents full length of soffits, unless otherwise indicated.

F. Separate dissimilar metals by painting each metal surface in area of contact with a bituminous coating, by applying rubberized asphalt or butyl underlayment to each metal surface, or by other permanent separation as recommended by manufacturers of dissimilar metals.

G. Form and fabricate sheets, seams, strips, cleats, valleys, ridges, edge treatments, integral flashings, and other components of copper roofing to profiles, patterns, and drainage arrangements shown and as required for permanently leakproof construction. Provide for thermal expansion and contraction of the work, as indicated. Seal joints as shown and as required for leakproof construction. Shop-fabricate materials to greatest extent possible.

H. Sealant-Type Joints: Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to conceal sealant completely. When ambient temperature is moderate at time of installation, 40 degrees to 70 degrees F (4 degrees to 21 degrees C), set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher or lower ambient temperatures. Do not install sealant-type joints at temperatures below 40 degrees F (4 degrees C). Comply with requirements of Division 07 "Joint Sealant" Sections for handling and installing sealants.

I. Fabricate and install work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, excessive waves, and avoidable tool marks considering temper and reflectivity of metal. Provide uniform, neat seams with minimum exposure of solder, and sealant. Except as otherwise shown, fold back sheet metal to form a hem on concealed side of exposed edges.

J. Conceal fasteners and expansion provisions where possible in exposed work and locate so as to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

K. CLEANING
1. Daily clean work areas by sweeping and disposing of debris.

2. Upon completion of the work of this Section in any given area, remove tools, equipment and all rubbish and debris from the work area; leave area in broom- clean condition.

3.4 INSTALLATION OF GUTTER SYSTEM:

A. Submit product design drawings for review and approval to Architect or Specifier before fabrication.

B. Installing contractor shall check as-built conditions and verify the manufacturer's gravel stop details for accuracy to fit the wall assembly prior to fabrication. The installer shall comply with the roof edging manufacturer's installation guide when setting edging.

C. Installer shall furnish mechanical fasteners consistent with manufacturer's instructions; suitable for the substrate to which being installed.

3.5 FINAL CLEANING

A. All Work shall be kept as clean as possible so that cleaning down may be accomplished easily. Protect all surfaces from stain at all times to guard from discoloration.

END OF SECTION

SECTION 07 84 00

FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install fireproof firestopping, firesafing materials, smoke seals and related accessories required for this Project for all penetrations through fire resistance rated construction, including, but not limited to, penetrations for elevators, plumbing, fire suppression, heating, ventilating and air conditioning, electrical systems, and specialized equipment.

1. Fire resistance rated construction requiring firestopping includes, but is not limited to: floors, rated partitions, smoke barriers, smoke partitions, partitions in rated corridors, passageways and stairs, shaft partitions, shaft wall (vertical and horizontal), area separation fire walls, party wall systems, and temporary fire resistant rated partitions and barriers.

2. Provide removable temporary firestopping (pillows) to maintain fire integrity prior to Owner's final acceptance, to permit installation of electrical, telephone, data and sound system wiring. Replace temporary firestopping with permanent, after wiring systems are completed.

B. Furnish and install firestopping/smoke seals at construction joints occurring at tops of fire resistance rated partitions, smoke partitions, and temporary partitions between top of partition and underside of deck above.

C. Furnish and install all firestopping, firesafing, and smoke seals at perimeter of floor/roof construction and exterior wall systems, as indicated and where required by applicable codes.

D. Furnish and install all firestopping, firesafing, and smoke seals at expansion joints in chase walls where expansion joints are not exposed to view.

E. Furnish and install all firestopping, firesafing, and smoke seals where required by applicable codes and as additionally required by authorities having jurisdiction at no additional cost to the Owner.

1.2 RELATED REQUIREMENTS

A. Division 22 - PLUMBING: Plumbing system penetrations through fire resistance rated construction.

B. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING: Heating, ventilating and air conditioning system penetrations through fire resistance rated construction.

C. Division 26 - ELECTRICAL: Electrical penetrations through fire resistance rated construction.

1.3 REFERENCES

A. Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. ASTM E-84 - Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM E-119 - Method for Fire Tests of Building Construction and Materials.
3. ASTM E-814 - Test Method of Fire Tests of Through-Penetration Firestops.
4. NFPA 70 - National Electrical Code.
5. UL - Fire Resistance Directory.
6. UL 1479 - Fire Tests of Through Penetration Firestops.

1.4 PERFORMANCE REQUIREMENTS

A. Provide materials and work to conform to Building Code Requirements in fire resistant wall and floor assemblies.

B. Manufacturer’s certified product test requirements:

1. All firestop/smokeseal material shall be tested by a recognized, independent testing agency and shall conform to both Flame (F-rating) and Temperature (T-rating) requirements of ASTM E-814.
2. Conform to UL Fire Hazard Classification Requirements.
3. Tested and classified non-combustible per ASTM E-84.

C. Firestops in place shall be of sufficient thickness, width, and density to provide a fire resistance rating at least equal to the floor, wall, or partition construction into which it is installed.

D. Non-combustible dams shall be constructed:

1. As necessary to achieve fire rating as tested and rated.
2. In conformance with installation requirements for type of floor, wall, and partition construction.
3. As recommended by firestop/smokeseal manufacturer.

E. Combustible damming materials, if used, must be removed after proper curing.

1.5 SUBMITTALS

A. Submit the following under provisions of Section 01 33 00 - SUBMITTAL PROCEDURES:

1. Literature: Manufacturer's product data sheets, specifications, performance data, and physical properties.
   a. Indicate requirements for manufacturer’s descriptive data for products and related materials with FM, UL or Warnock-Hersey illustrations showing systems and approval of materials in systems.
2. Certification: Manufacturer's written certification stating that firestopping

materials, meet or exceed the requirements specified under this Section and that all fire-resistive requirements for the indicated combustibility, Flame (F-rating) and Temperature (T-rating) Ratings have been met.

3. Manufacturer's installation instructions.
4. Test reports: Submit fire test reports from recognized, independent testing agent(s) indicating the following:
   a. Fire test report of firestop material applied to substrate and penetration materials similar to project conditions. Tests to indicate both Flame (F-rating) and Temperature (T-rating) Ratings.
   b. Test reports of products to be used shall indicate conformance to ASTM E-814.
5. On-site sample installation to be included in Work: Minimum thirty days prior to application in any area, provide samples of firestop and smokeseal materials and installation in accordance with the following requirements.
   a. Apply one sample of appropriate firestop and smokeseal material for each different penetration and fire rating required for the work.
   b. Sample areas will comply with thickness, fire resistance ratings, and finished appearance of the project and applicable fire code.
   c. Acceptance samples will constitute standard of acceptance for method of application, thickness, and finished appearance for firestop and smokeseal application. The sample(s) shall remain visible during completion of the work and shall remain as part of the completed work.
6. Shop drawings indicating requirements for penetrations in wall/deck intersections, change of planes, control joints, expansion joints and blank openings.

1.6 QUALITY ASSURANCE

A. Obtain firestop and smokeseal products from a single manufacturer, except as otherwise approved by Architect.

B. Environmental Requirements for Volatile Chemicals: Use firestopping caulks that comply with the following limits for VOC content:
   1. Firestopping caulks: VOC not more than 250 g/L.

C. Notify the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.

D. Special Inspections: Allow for 3 percent of each type of firestopping system to be removed and inspected for conformance with approved submittals.
   1. All firestopping shall be inspected prior to installation of suspended ceilings or concealed by other materials.

1.7 QUALIFICATIONS

A. Installer, a specialized subcontractor having not less than 3 years documented experience demonstrating previously successful work of the type specified herein.
   1. The manufacturer of the firestop material shall submit written certification that

the firm to be used for the firestop products has been trained in the application of the products by the manufacturer.

1.8 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire resistance ratings and surface burning characteristics.

B. Obtain certificate of compliance from authority having jurisdiction indicating approval of combustibility.

1.9 MOCK-UPS

A. Provide mock-ups under provisions of Section 01 45 00 - QUALITY CONTROL for purpose of verifying quality of firestop installation.

B. Provide firestop samples and locate as directed. Accepted samples may remain as part of the work.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver and store firestopping materials in original, sealed, packages showing manufacturer’s identification and date of packaging.

B. Store and handle materials following manufacturer's recommended procedures, and in accordance with material safety data sheets.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: To establish a standard of quality, design, function desired, and appearance, Drawings and specifications have been based on Hilti, Inc. Tulsa OK. products specified herein below.

B. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:

1. Hilti, Inc. Tulsa OK.
2. Bio Fireshield (A Division of Rectroseal), Houston TX.
3. Dow Corning Corporation, Midland MI.
4. 3M Company, Saint Paul MN.
5. Specified Technologies, Inc., Somerville NJ.
6. Metacaulk, (A Division of Rectroseal), Houston TX.
7. Tremco, Inc., Beachwood OH.

2.2 MATERIALS

A. Firestop mortar: asbestos free, cementitious mortar, U.L. classified as a "fill, void, or cavity material" for through penetration firestop system when tested in

accordance with ASTM/UL1479.

1. Acceptable products include the following, or approved equal:
    a. Hilti, Inc., product “CP 637 Firestop Mortar”.
    b. Bio Fireshield, product “Novasit K-10”.
    c. Specified Technologies, Inc., product “Spec Seal Mortar”.
    d. Tremco Inc., product “Tremstop M”.

B. Silicone Firestop sealant: Single component, non-combustible silicone elastomer firestop sealant, U.L. classified as a "fill, void, or cavity material" for through penetration firestop system when tested in accordance with ASTM E-814/UL1479.
    1. Acceptable products include the following, or approved equal:
        a. Hilti, Inc., product “CP 601S Elastic Firestop Sealant”.
        b. Bio Fireshield, product product “Biotherm 100" (Gun Grade) or “Biotherm 200" (Self Leveling).
        c. Specified Technologies, Inc., product “Spec Seal Pensil 300 Sealant (gun grade)” or “Spec Seal Pensil 300SL" (Self Leveling).
        d. 3M Company, product “Fire Barrier Silicone Sealants”.
        e. Tremco Inc., product product “Tremsil" (Gun Grade) or “Tremsil S/L" (Self Leveling).
    2. Sealants will not dissolve in water.

C. Intumescent firestop sealant and caulks: Acrylic based, water resistant sealant, which will not re-emulsify after drying.

    1. Acceptable products include the following, or approved equal:
        a. Hilti, Inc., product “FS-ONE Intumescent Firestop Sealant” or “FS 657 Fireblock”.
        b. Bio Fireshield, product “Biostop 500".
        c. Specified Technologies, Inc., product “Spec Seal Triple-S Sealant".
        d. 3M Company, product “Fire Barrier Caulk CP25WB+".
        e. Tremco Inc., product “Tremstop 1A".

D. Firestop putty: sticks or pads.
    1. Acceptable products include the following, or approved equal:
        a. Hilti, Inc., product “CP 618 Firestop Putty” or “CFS-P PA Firestop Putty Pad”.
        b. Bio Fireshield, product “Moldable Putty”.
        c. Specified Technologies, Inc., product “Spec Seal Putty Bars and Pads”.
        d. 3M Company, product “Fire Barrier Moldable Putty”.
        e. Tremco Inc., product “Flowable Putty”.

E. Firestop collars: Pre-manufactured fire protective pipe sleeve, UL classified as "fill, void, or cavity material" for through penetration firestop system when tested in accordance with ASTM E-814/UL1479.

1. Provide separated (two piece) firestop collar for application when plastic pipe or telecommunications cabling system is already in place. Provide non-separated firestop collar for application prior to installation of plastic pipe system.
2. Acceptable products include the following, or approved equal:
    a. Hilti, Inc., product “CP 643 Firestop Collar”, “CP 644N Firestop Collar” and “CFS-CC Firestop Cable Collar”.
    b. 3M Company, Inc., product “Fireshield Firestop Sleeve”.
    c. Specified Technologies, Inc., product “Spec Seal Collars”.
    d. 3M Company, product “Fire Barrier PPD’s”.
    e. Tremco Inc., product “Fyrecan sleeve”.

F. Firestop blocks and pillows: UL Classified as "fill, void, or cavity material" for through penetration firestop system when tested in accordance with ASTM E-814/UL1479.
1. Acceptable products include the following, or approved equal:
    a. Hilti, Inc., product “CFS-BL Firestop Block”.
    b. Bio Fireshield, product “Fireshield Firestop Pillows”.
    c. Specified Technologies, Inc., product “Spec Seal Pillows”.
    d. Tremco Inc., product “Tremstop P.S”.

G. Wrap strips:
1. Acceptable products include the following, or approved equal:
    a. Hilti, Inc., product “CP 645-E Endless Wrap Strip”, or “CP 648-S Firestop Wrap Strip”.
    b. Bio Fireshield, product “FS-195”.
    c. Specified Technologies, Inc., product “Spec Seal Wrap Strip”.
    d. 3M Company, product “Fire Barrier FS195 Wrap Strip”.
    e. Tremco Inc., product “Tremco W.S”.

H. Mineral fiber / ceramic wool non-combustible insulation (fire safing): Provide Hilti, Inc., product “Mineral Wool, Item No. 00236993.” Or US Gypsum Company product “Thermafiber” having a minimum density of 4 pounds per cubic foot, Fibrex product “FBX Safing Insulation” having a minimum density of 4 pounds per cubic foot, or provide Manville Corporation product “Ceramic Fiber Insulation” having a minimum density of 6 pounds per cubic foot, or approved equal product to suit conditions and complying with firestop manufacturer's requirements.
1. Provide galvanized steel safing clips for installation of insulation.
2. Material shall be classified non-combustible per ASTM E-814.

I. Elastomeric Firestopping: Non halogenated latex based elastomeric coating applied by airless spray, product Hilti, Inc., product “CFS-SP WB 672 Speed Spray” , “CFS-S SIL, Specified Technologies, Inc., product “SL Silicone Sealant Self Leveling” or “Spec Seal Elastomeric Firestop Spray”.

J. Firestop Devices: Factory assembled firestopping devices sized to fit specific diameter of penetrant.

1. Acceptable products include the following, or approved equal:

a. Floor Slabs:

1) Hilti, “CP680 Series” Cast-In Firestop Device.
2) Hilti, “CFS-DID” Drop-In Device.
3) Hilti, “CP 681” Tub Box Cast-In Kit

b. Walls:

1) Hilti, “CP 653” Firestop Sleeve.
2) Hilti, “CFS-SL SK” Firestop Sleeve Kit.
3) Hilti, “CFS-SL GP” Firestop Sleeve Gangplate

2.3 ACCESSORIES

A. Forming and damming materials: Mineral fiberboard or other type as recommended by firestopping manufacturer.

B. Primer, sealant and solvents: As recommended by manufacturer.

C. Woven wire mesh: Galvanized 20 gage woven wire mesh “chicken wire” or “poultry fencing”, 1 inch spacing.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where firestops are to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface to receive firestops shall be free of dirt, dust, grease, oil, form release agents, or other matter that would impair the bond of the firestop material to the substrate or penetrating item(s).

B. Voids and cracks in substrate shall be filled and unnecessary projection removed prior to installation of firestops.

C. All penetrating items shall be permanently installed prior to firestop installation.

D. Substrate shall be frost, free and, when applicable, dry.

3.3 INSTALLATION

A. General

1. Installation of firestops shall be performed by applicators/installers qualified and trained by the manufacturer. Installation shall be performed in strict accordance with manufacturer's detailed installation procedures.

2. Apply firestops in accordance with fire test reports, fire resistance

requirements, acceptable sample installations, and manufacturer's recommendations. Meet building code requirements.

3. Coordinate with plumbing, mechanical, electrical, and other trades to assure that all pipe, conduit, cable, and other items which penetrate fire rated construction have been permanently installed prior to installation of firestops. Schedule and sequence the work to assure that partitions and other construction which would conceal penetrations are not erected prior to the installation of firestops.
    a. Ensure that all firestopping is inspected prior to installation of suspended ceilings or concealed by other finished materials.

B. Dam construction
1. Install dams when required to properly contain firestopping materials within openings to achieve required fire resistance rating. Combustible damming material must be removed after appropriate curing. Incombustible damming material may be left as a permanent component of the firestop system.
2. Placement of dams shall not interfere with function or adversely affect the appearance of adjacent construction.

C. Installation of single component silicone firestop
1. Apply with manual or powered caulking gun.
2. Apply minimum 1/2 inch thickness for 2 hour rating. Apply 1/2 inch to both sides of wall penetrations; one side only in floor penetrations.
3. Use incombustible insulation to achieve fire resistance rating.
4. Surface of gun grade silicone firestop may be tooled using clean, potable water.
5. Clean excess material off of adjacent surfaces and tools within 10 minutes using either water or Xylol where the use of such would not be hazardous.

D. Installation of cementitious firestop mortar.
1. Add dry powder to water and mix with mechanical mixer or hand mixing tools as recommended by firestop mortar manufacturer. Allow a average mixing time is 3 minutes and provide a average wet density of 70 pounds per cubic foot, plus or minus 5 PCF.
2. Do not apply if ambient or substrate temperature is less than 35 degrees Fahrenheit during 24 hours after application.
3. Wet all surfaces prior to application of firestop mortar.
4. Mortar may be hand applied or pumped into the opening.
5. Exposed surfaces shall be finished using conventional plastering tools prior to curing.
6. When installation around layered cables, it is recommended to increase the fluidity of the firestop mortar to provide a better fill around the cables. Vibrate or move the cables slightly to prevent voids from forming between the cables.
7. Allow 48 hours for initial cure prior to form removal. For full cure allow 27 days.
8. Wet material may be cleaned with water. Dry material may require scraping or chipping.

E. Installation of firestop collars (plastic pipe only)

1. Firestop collars may be surface mounted to a slab or wall or imbedded in Firestop Mortar to a maximum depth of 2 inches.
2. For wall penetrations with ABS pipe firestop collars must be installed on both sides of the penetration to provide a 2 hour F and T Rating. All other applications required installation on one side only to provide a 2 hour F and T Rating.

F. Firesafing insulation: Install firestopping safing insulation on safing clips spaced as needed between each stud and floor slab, leaving no voids. Secure safing clips to slab using fasteners recommended by insulation manufacturer. Install sealant over mineral wool in accordance with test requirements.

3.4 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified independent inspecting agency to inspect through-penetration firestop systems and to prepare test reports.

1. Inspecting agency will state in each report whether inspected through-penetration firestop systems comply with or deviate from requirements.

B. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued.

C. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

3.5 SCHEDULE

A. General: Typical penetrations are indicated below with list of standard firestopping/smokeseal approaches. Actual firestopping materials and combination of materials will vary with size of penetration and with individual firestopping manufacturer's approved UL Design System Requirements. Use only UL Design System materials for each penetration that best matches the wall and floor construction.

1. Where penetrations occur for which no listed UL or WH Design System test exists, obtain from the firestop system manufacturer an engineered system acceptable to the authorities having jurisdiction for firestopping such penetrations. Engineered system from manufacturer shall include a detail drawing showing the engineered system and shall contain no disclaimers.

B. Single metal pipe (non-insulated) and conduit penetrations through floors:

1. Firestop mortar.
2. Silicone Firestop sealant.
3. Intumescent firestop sealant.
4. Firestop putty, sticks or pads.
5. Mineral fiber / ceramic wool non-combustible insulation (fire safing) in conjunction with a firestop sealant.

C. Single metal pipe (non-insulated) and conduit penetrations through walls:
   1. (masonry and concrete walls only) Firestop mortar and putty.
   2. Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).
   3. Intumescent firestop sealant with wrap strips.

D. Multiple metal pipe and conduit penetrations through floors:
   1. Firestop mortar and wrap strips.
   2. Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).

E. Multiple metal pipe and conduit penetrations through walls:
   1. Firestop mortar and putty.
   2. (through masonry walls only) Firestop pillows with woven wire mesh.
   3. Silicone Firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).

F. Insulated metal pipe penetrations through floors:
   1. Firestop mortar and wrap strips.
   2. Silicone Firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).
   3. Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).
   4. Silicone Firestop sealant over wrap strip.
   5. Mineral fiber / ceramic wool non-combustible insulation (fire safing) in conjunction with a firestop sealant.

G. Insulated metal pipe penetrations (single and multiple) through walls:
   1. Firestop mortar with wrap strips.
   2. Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).
   3. Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing) and Wrap strips.
   4. (multiple penetrations through masonry walls only) Firestop pillows with woven wire mesh.

H. Duct penetrations through floors or walls:
   1. Rectangular and square ducts: Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing), and steel flanges provided under Division 15.
   2. Round ducts: Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).

I. Combustible plastic pipe and conduit penetrations through floors:
   1. Firestop mortar with wrap strips.

2. Firestop mortar with firestop putty and firestop collars.
3. Silicone firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).
4. Silicone firestop sealant and firestop collars.
5. Intumescent firestop sealant and firestop collars.
6. Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing) with firestop collars.
7. (maximum pipe size 2 inches) Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing) with wrap strips.

J. Combustible plastic pipe and conduit penetrations through walls:
1. Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).
2. Intumescent firestop sealant with firestop collars.

K. Cable penetrations through floors:
1. Silicone Firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).
2. Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).

L. Cable penetrations through walls:
1. Silicone Firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).
2. Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).
3. (single penetrations only) Firestop putty.
4. (electrical boxes) Firestop pads.
5. Firestop putty over mineral fiber / ceramic wool non-combustible insulation (fire safing).

M. Bus ducts through floors:
1. Firestop mortar and wrap strips.
2. Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing) and 28 gage (minimum) steel cover plate.

N. Blank openings:
1. Firestop mortar.
2. Silicone Firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).

O. Fire rated joints:
1. Silicone Firestop sealant over backer rod or bond breaker.

P. Floor to curtain wall assemblies:

1. Silicone Firestop sealant/mastic over mineral fiber / ceramic wool non-combustible insulation (fire safing).

Q. Construction joints at head of wall/floor assemblies:

1. Silicone Firestop sealant/mastic over mineral fiber / ceramic wool non-combustible insulation (fire safing).
2. Elastomeric spray over mineral fiber / ceramic wool non-combustible insulation (fire safing).

R. Smoke barrier sealant for dampers, fire door frames:

1. Silicone Firestop sealant.

S. Temporary sealing of openings and penetrations:

1. Firestop putty, sticks or pads.
2. Firestop pillows.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Provide all joint sealer Work as indicated on the Drawings, as required for the completed Work, and as specified herein. This Section includes joint sealants for the following applications:

1. Interior and Exterior joints in the following vertical surfaces and horizontal surfaces:

a. Perimeter joints between exterior trim, louvers and masonry both sides (exterior). This shall include sealant between metal drip edge and frames of doors, windows, typical.

b. Joints between new soffit panels and trims, exterior penetrartions, exterior fascia and trim

c. Joints between conduit, pipe and misc. penetrations through exterior window / storefront / curtain wall panels and masonry.

d. Joints in exterior carpentry standing and running trim.

e. Other joints where indicated on drawings

f. All staging, scaffolding and hoisting for the work of this Section.

1.03 REFERENCES

A. References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work

1. American Society for Testing and Materials (ASTM)

1.04 Related Sections

A. Section 02 41 19 - SELECTIVE DEMOLITION

B. Section 06 10 00 – ROUGH CARPENTRY

C. Section 07 53 23 – Roofing (Adhered EPDM Roof System)

1.05 SUBMITTALS

A. Product Data

Catalog sheets, specifications, and installation instructions for each product specified except miscellaneous materials.

B. Samples for Initial Selection:

1. For general purpose use around windows and at relieving angles, Colors of Exposed Joint Sealants: Match Architect's samples. Provide custom colors as specified.

2. For all other uses: provide Manufacturer’s color charts consisting of strips of cured sealants showing the full range of Manufacturer’s standard colors available for each product exposed to view.

C. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-(13-mm-) wide joints formed between two 6-inch-(150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants

D. Quality Control Submittals

1. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.

2. Installer's Qualifications Data: Affidavit required under Quality Assurance Article.

3. Company Field Advisor Data: Name, business address, and telephone number of Company Field Advisor.

4. Test Results

a. Sealant manufacturer’s test reports certifying compatibility with all contiguous materials.

b. Sealant manufacturer’s test reports certifying that the sealant will not stain contiguous materials.

c. The results of field adhesion testing.

1.06 QUALITY ASSURANCE

A. Installer's Qualifications

The persons installing the sealants and their supervisor shall be personally experienced in the installation of sealants and shall have been regularly employed by a company engaged in the installation of sealants for a minimum of two years.

1. Furnish a letter from the sealant manufacturer, stating that the Installer is authorized to install the manufacturer's sealant materials.

B. Container Labels

Include manufacturer's name, trade name of product, kind of material, federal specification number (if applicable), expiration date (if applicable), and packaging date or batch number.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joint sealer materials as recommended by the Manufacturer, to protect from damage.

1.08 PROJECT CONDITIONS

A. Environmental Requirements

1. Temperature: Unless otherwise approved or recommended in writing by the sealant manufacturer, do not install sealants at temperatures below 40 degrees F or above 85 degrees F.

2. Humidity and Moisture: Do not install the Work of this Section under conditions that are detrimental to the application, curing, and performance of the materials.

3. Ventilation: Provide sufficient ventilation wherever sealants, primers, and other similar materials are installed in enclosed spaces. Follow manufacturer's recommendations.

4. Do not proceed with installation of joint sealants under the following conditions

a. When joint substrates are wet.

b. Where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

c. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.

d. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

e. Surfaces are frozen.

f. Surfaces are superheated by the sun.

B. Protection

1. Protect all surfaces adjacent to sealants with non-staining removable tape or other approved covering to prevent soiling or staining.

2. Protect all other surfaces in the Work area with tarps, plastic sheets, or other approved covering to prevent defacement from droppings.

3. Protect any painted surfaces which are not included in the Work from impact or damage.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. General Electric Co., Waterford, NY 12188

B. Dow Corning Corp., Midland, Michigan 48686

C. Pecora Corp., Harleyville, PA

D. ChemRex Inc. - Sonneborn, Shakopee, MN 55379

E. Tremco Sealing and Coatings,Wading River, NY 11792

F. Bostik, Midland, MA 01949

G. Sika Corporation, Lyndhurst, NJ 07071

2.02 SEALANTS

A. Type 1 Sealant - For general use around windows, door frames, louvers, general pipe penetrations, flashings and adjacent concrete walks to exterior walls.

One-part silicone sealant; ASTM C920 classifications type S, grade NS, class 25, uses NT, M, G, A and O: Pecora 890; Tremco Spectrum-1 or Sika's SikaSil WS 295.

Provide custom colors for use around window perimeters, to match window frame or masonry, or other colors as determined by the Architect. It is the intention of this specification that any color produced by the manufacturer is available in the attempt to match the Window, Storefront Curtainwall framing and door systems.

B. Type 2 Sealant (for concealed bedding only).

One-part butyl rubber sealant; Pecora's BC-158, PTI's 707, Bostik's Chem-Calk 300, or Tremco Butyl.

C. Type 3 Sealant (use at high temperature applications, e.g., gas flues)

One-part silicone sealant for high temperature; ASTM C920 classifications type S, grade NS, class 25, uses NT, M, G, and A: Dow Corning's Silastic 726 RTV, General Electric's RTV 106, or Tremco Spectrem 1.

D. Sealant Materials, General Requirements:

1. Only use sealant and primers that comply with the following limits for VOC content:
    a. Architectural Sealants: 250 g/L.
    b. Roofing Sealants: 450 g/L.
    c. Roadway Sealants: 250 g/L.
    d. Sealant primer: 250 g/L.
2. Sealants containing aromatic solvents, fibrous talc, formaldehyde, halogenated solvents, mercury, lead, cadmium, chromium and their compounds, are not permitted.

E. Joint Sealer Type AP (Acrylic painters caulk): One component acrylic latex caulking compound, conforming to FS 19-TP-21M and ASTM C 834, paintable within 24 hours after application, with a minimum movement capability of ±12.5 percent, equal to one of the following:

1. Sonneborn, product, “Sonolac”.
2. Tremco, product, “Tremflex 834”.
3. Bostik, product, “Chem-Calk 600”.
4. Pecora, product “ AC-20+”. (Addendum 1, A-1.14)

F. Joint Sealer Type BP2 (Bitumen modified polyurethane, Multi-component): Pouring grade self-leveling bitumen modified two component urethane sealant, conforming to ASTM C920, Type M, Grade P, Class 25 and FS SS-S-00227E, Type 1, Class A, with a minimum movement capability of +50/-25 percent, equal to one of the following:

1. Tremco, product “Vulkem 202”.
2. Sonneborn, product “Sonomeric 2”.
3. Pecora, product “Urexpan NR-300”. (Addendum 1, A-1.14)

G. Joint Sealer Type HL1 (Horizontal-self-Leveling, 1-component): Pouring grade self-leveling modified urethane or neutral cure silicone sealant, conforming to FS TT-S- 000230C, Type I, Class A, and ASTM C 920 Type S, Grade P, Class 25, with a minimum movement capability of ±25 percent, equal to the following:

1. GE silicones, product “Tosseal 817” (silicone).
2. Sika, product, “Sikaflex 1CSL” (urethane).
3. Sonneborn, product, “SL1” (urethane).
4. Tremco, product “Vulkem 45” / 45 SSL (urethane). (Addendum 1, A-1.14)

H. Joint Sealer Type P1 (Polyurethane 1-component): Low modulus single component gun-grade polyurethane sealant, non-sagging, conforming to FS TT-S-000230C, Type I, Class A, and ASTM C 920, Type S, Class 12-1/2, Grade NS, use NT,M, A and O with a minimum movement capability of ±25 percent, equal to the following:

1. Pecora, product “Dynatrol I”.
2. Sika, product “Sikaflex”.
3. Sonneborn, product “Sonolastic NP1”.
4. Tremco, product “Vulkem 116”, or “Dymonic”. (Addendum 1, A-1.14

I. Joint Sealer Type SC (Silicone, general construction): One-part medium modulus, natural cure, synthetic sealant, having a useful life expectancy of at least 20 years, conforming to ASTM C 920, Type S, NS, Class 25, use NT, G, A, M, O with a minimum movement capability of ±50 percent, equal to the following:

1. Dow Corning, product, “791”.
2. GE Silicones, product, “Silpruf”.
3. Pecora, product, “895”. (Addendum 1, A-1.14)
4. Sika, product, “Sika Sil-C 995”.
5. Sonneborn, product, “Sonolastic - OmniSeal”.
6. Tremco, product, “Spectrem 2”. (Addendum 1, A-1.14)

J. Joint Sealer Type SE (Silicone, Exterior construction): One-part low modulus, moisture curing, synthetic rubber sealant, having a useful life expectancy of at least 20 years,conforming to ASTM C 920, Type S, NS, Class 25, FS TTS- 001543A, Type, Class

A with a minimum movement capability of +100 percent and -50 percent, equal to the following:

1. Dow Corning, product, “790”.
2. GE Silicones, product, “SCS9000 SilPruf NB”.
3. Sika, product “Sika Sil-C 990”.
4. Tremco, product “Spectrem 1”. (Addendum 1, A-1.14)

2.03 JOINT FILLERS

A. Elastomeric Tubing Sealant Backings: (for precast panel joints not compatible with Silicone Sealants): Neoprene, butyl or EPDM tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F (minus 32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

ASTM D 1056, Class SC (oil resistant and medium swell), 2 to 5 psi compression deflection.

B. Expanded Polyethylene Joint Filler (for existing joints)
Flexible, compressible, closed-cell polyethylene of not less than 10 psi compression deflection (25 percent).

C. Closed-Cell Polyurethane or Closed-Cell Expanded polyethylene Joint Filler (for all cast-in-place concrete work).

Resilient, compressible, semi-rigid; W.R. Meadow's Ceramar; A. C. Horn's Closed Cell Plastic Foam Filler, Code 5401; Sonneborn's Sonoflex F.

D. ASTM D1056, Class RE41 (for masonry joints) where shown on the Drawings.

E. Filler Sealant (for Parapet Expansion Joints)

Polybutylene impregnated compressible polyurethane foam precompressed to 50% of its uncompressed length: "Polytite" by Polytite Manufacturing Corp. and distributed by W.R. Grace Co.

2.04 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

1. For primers used on site and within the weatherproofing/waterproof membrane (interior) of the building comply with V.O.C. requirements specified in Section G01600.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

1. For cleaners used on site and within the weatherproofing/waterproof membrane

(interior) of the building comply with V.O.C. requirements specified in Section G01600.

C Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

1. Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

2. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin)], O (open-cell material)] or B (bicellular material with a surface skin, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

D. Bond Breaker Tape

Polyethylene or other plastic tape as recommended by the sealant manufacturer; non-bonding to sealant; self-adhesive where applicable.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine all joint surfaces for conditions that may be detrimental to the performance of the completed Work. Do not proceed until satisfactory corrections have been made.

3.02 PREPARATION

A. Clean joint surfaces immediately before installation of sealant and other materials specified in this Section.

1. Remove all loose materials, dirt, dust, rust, oils and other foreign matter that will impair the performance of materials installed under this Section.

2. Remove protective coatings and similar materials from joint faces with manufacturer's recommended solvents.

3. Use methods such as grinding, acid etching or other approved and manufacturer's recommended means, if required, to clean the joint surfaces, assuring that the sealant materials will obtain positive and permanent adhesion.

3.03 JOINT BACKING INSTALLATION

A. Install bond breaker tape in relaxed condition as it comes off the roll. Do not stretch the tape. Lap individual lengths.

B. Install backer rod of sufficient size to fill the joint width at all points in a compressed state. Compress backer rod at the widest part of the joint by a minimum of 25 percent. Do not cut or puncture the surface skin of the rod.

3.04 SEALANT INSTALLATION

A. Except as shown or specified otherwise, install sealants in accordance with the manufacturer's printed instructions.

B. Install sealants with ratchet hand gun or other approved mechanical gun. Where gun application is impracticable, install sealant by knife or by pouring, as applicable.

C. Finishing

Tool all vertical, non-sag sealants so as to compress the sealant, eliminating all air voids and providing a neat smoothly finished joint. Provide slightly concave joint surface, unless otherwise indicated or recommended by the manufacturer.

1. Use tool wetting agents as recommended by the sealant manufacturer.

3.05 FIELD QUALITY CONTROL

A. Field Adhesion Testing of Sealants - Test completed elastomeric joints as follows:

1. Extent of Testing: Test completed elastomeric sealant joints as follows:

a. Perform 10 tests for the first 1000 feet of joint length for each type of elastomeric sealant and join substrate.

b. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.

2. Test Method – Test joints by hand pull method described below:

a. Make knife cuts from one side of the joint to the other, followed by two cuts approximately 2 inches long at sides of joint and meeting cross cut at one end. Place a mark 1 inch from cross-cut end of 2 inch piece.

b. Use fingers to grasp 2 inch piece of sealant between cross-cut end and 1” mark, pull firmly at a 90 degree angle or more in direction of side cuts while holding a ruler along sides of sealant. Pull sealant out of joint to the distance recommended by the sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension, hold this position for 10 seconds.

c. For joints with dissimilar substrates, check adhesion to each substrate separately. Do this by extending cut along one side, checking adhesion to opposite side.

3. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field-adhesion-test log.

4. Inspect tested joints and report on the following:

a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare

these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.

b. Whether sealants filled joint cavities and are free of voids.

c. Whether sealant dimensions and configurations comply with specified requirements.

5. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.

6. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

7. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.06 CLEANING

A. Immediately remove misapplied sealant and droppings from metal surfaces with solvents and wiping cloths. On other materials, remove misapplied sealant and droppings by methods and materials recommended in writing by the manufacturer of the sealant material.

B. After sealants are applied and before skin begins to form on sealant, remove all masking and other protection and clean up remaining defacement caused by the Work.

END OF SECTION

SECTION 22 00 01

PLUMBING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Documents identified in Division 1.

1.02 REFERENCES

A. Conditions of the Contract and Division 1, General Requirements, apply to work of this Section. Where Paragraphs of this Section conflict with similar paragraphs of Division 1, requirements of this Section shall prevail.

B. The attention of this contractor is directed to Part 3, Paragraph 3.01 of this Section, which contains instructions for commissioning of systems and equipment.

C. Examine Drawings and other Sections of Specifications for requirements that affect work of this Section.

1.03 DEFINITIONS

A. As used in this Section, "provide" means "furnish and install" and "HVAC" means "Heating, Ventilating and Air Conditioning" and "POS" means "Provided under Other Sections". "Furnish" means "to purchase and deliver to the project site complete with every necessary appurtenance and support," and "Install" means "to unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project."

1.04 GUARANTEE/WARRANTY

A. Guarantee work of this Section in writing for two (2) years following the date of initial building occupancy or turning over of the building to the owner, whichever is earlier. Repair or replace defective materials, equipment, workmanship and installation that develop within this period.

1.05 SCOPE

A. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specification. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.

B. Furnish and install or perform the following, as shown on the drawings and as specified herein:

1. Removal and replacement of the natural gas system throughout the roof scope of work connecting to each and every piece of rooftop equipment requiring natural gas.
    a. Painting of all new and existing exterior natural gas piping.
2. Existing plumbing vents through roof terminations will be extended to a minimum 18” above the new roof height.
3. All fittings, accessories and miscellaneous items as necessary to complete the work.

4. Preconstruction and Post construction testing of storm drain system.
5. Pipeline identification.
6. Hangers, plates and inserts.
7. All supplementary steel for piping and equipment support.
8. Guarantees.
9. Drilling for installation of inserts.
10. Core drilling.
11. Scaffolding, hoisting and rigging.
12. Sleeves
13. Clean all roof drain systems from roof level to achieve a free-flowing system.

1.06 CONTRACT DOCUMENTS

A. Refer to Architectural, HVAC, Electrical, Utility and other Drawings and other Sections that indicate types of construction in which work shall be installed and work of other trades with which work of this Section must be coordinated.

1.07 DISCREPANCIES IN DOCUMENTS

A. Where Drawings or Specifications do not coincide with manufacturer's recommendation, or with applicable codes and standards, alert Architect in writing before installation.

B. In cases where the contractor believes he needs engineering guidance, he shall submit a sketch identifying his proposed solution and the Architect shall review the sketch and note if necessary.

1.08 MODIFICATIONS IN LAYOUT

A. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Architect.

B. Check Contract Drawings as well as Shop Drawings of all subcontractors to verify and coordinate spaces in which work of this section will be installed.

C. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.

D. Make reasonable modifications in layout and components needed to prevent conflict with work of other trades and to coordinate according to Paragraphs A, B, C, D above. Systems shall be run in a rectilinear fashion.

E. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Architect for review and approval.

1.09 RELATED WORK IN OTHER SECTIONS

A. The following work is not included in this Section and will be performed under other Sections (abbreviation POS on Drawings means, "Provided Under Other Sections"):

1. SECTION 075323 Roofing EPDM.
2. SECTION 076200 Sheet Metal Work, Flashing and Trim
3. SECTION 075323 Roofing.
4. SECTION 079200 Joint Sealants.

1.10 CODES, STANDARDS, AUTHORITIES AND PERMITS

A. Perform work in strict accordance with the rules, regulations, standards, codes, ordinances, and laws of local, state, and federal governments, and other authorities that have legal jurisdiction over the site. Materials and equipment shall be manufactured, installed and tested as specified in latest editions of applicable publications, standards, rulings and determinations of:

1. Local and state building, plumbing, mechanical, electrical, fire, health and Environmental department codes.
2. American Gas Association (AGA).
3. National Fire Protection Association (NFPA).
4. American Insurance Association (A.I.A.) (formerly National Board of Fire Underwriters).
5. Occupational Safety and Health Act (OSHA).
6. Factory Mutual Association (FM) if applicable to project.
7. Underwriters' Laboratories (UL).
8. American National Standards Institute (ANSI).
9. Compressed Gas Association (CGA).

B. Material and equipment shall be listed by Underwriters' Laboratories (UL), and approved by ASME, AGA, and FM for intended service.

C. Most recent editions of applicable specifications and publications of the following organizations form part of Contract Documents:

1. American National Standards Institute (ANSI).
2. American Society of Mechanical Engineers (ASME).
3. National Electric Manufacturers Association (NEMA).
4. American Society for Testing and Materials (ASTM).
5. American Water Works Association (AWWA).

D. Secure and pay for all permits and inspections required by any of the authorities having jurisdiction.

1.11 RECORD DRAWINGS

A. Maintain at the job site at all times a complete set of black line prints and mark accurately, clearly and completely the actual installation in accordance with the requirements of this Section.

1.12 SUBMITTALS

A. Product Data

1. Hangers and Supports
2. Vent Piping
3. Gas Piping

PART 2 - PRODUCTS

2.01 PLUMBING FIXTURES

A. Provide plumbing fixtures as shown on Architectural and Plumbing Drawings.

B. Fixture trims, traps, faucets, escutcheons and waste pipes exposed to view in finished spaces shall be I.P.S. brass with polished chromium plating over nickel finish.

C. Provide air gaps at least twice diameter of waste pipe between level of each supply opening (except outlets protected with vacuum breakers) and flood rim of fixture receptacle.

D. Set fixtures with wall outlet flanges at proper distance from floors and walls with closet setting compound or gasket.

E. Refer to Architectural and Plumbing Drawings for quantities, locations and mounting heights of fixtures provided under this Section.

F. Catalog designations and manufacturers' names are specified to establish standards of quality for performance and materials. Equivalent fixtures by Kohler, American Standard Co., Zurn, or Crane Co. may be submitted for approval.

G. Fixtures:

1. Refer to the Plumbing Fixture Schedule on drawing P-000 for manufacturer and model numbers that are the basis of design.

2.02 PIPE MATERIALS

A.

Service:	Above ground vent.
Pipe Material:	Service weight cast iron no-hub conforming to CS301-72, or type DWV copper tube.
Fitting Material:	Cast iron, cast brass, stainless steel or wrought copper drainage fittings to suit pipe material.
Pipe Joint:	Gasket, screwed or soldered (50-50). Copper shall not be used for urinal waste. Silverbrite solder for pipe joints as required.

C.Service:	Above ground, storm system piping
Pipe Material:	Service weight cast iron no-hub conforming to CS301-72, or type DWV copper tube.
Fitting Material:	Cast iron, cast brass, stainless steel or wrought copper drainage fittings to suit pipe material.
Pipe Joint:	Gasket, screwed or soldered (50-50). Copper shall not be used for urinal waste. Silverbrite solder for pipe joints as required.

Service:	Natural gas.
` Pipe Material:	Schedule 40 black steel. Exposed piping shall be painted with two coats of rust inhibiting paint.
Pipe Joint:	Malleable iron, threaded (gas piping 2 ½-inch and larger shall be welded). Press fittings equal to megapress shall be accepted.

2.03 VALVES

A. Each valve type shall be product of single manufacturer. Each system shall be provided with valves as required by code and as shown on drawings. Valves shall be installed to facilitate operation, replacement and repair. Provide access panels where valves are concealed behind removable ceilings or walls. Provide shut-off valves for supply piping to individual pieces of equipment.

B. Backwater Valves

1. Backwater valves manufactured by Zurn, Watts, or approved equals.

2.04 HANGERS, ANCHORS, CLAMPS AND INSERTS

A. Provide adjustable clevis hangers for piping 3" and larger, and A band hangers for smaller piping. Support piping form building structure to maintain required grade and pitch of pipe lines, prevent vibration, secure piping in place, and provide for expansion and contraction. Secure hangers to inserts where practical. Hanger rods shall have machine threads.

B. Provide vertical brackets and guides for pipe risers at each floor and where horizontal piping is racked along walls. Trapeze hangers may be used where conditions permit. Provide extended hangers for insulated piping with 12" long galvanized insulation shields. Hangers for copper piping shall be copper or bronze or shall be coated for dielectric isolation.

C. Hanger rods shall be connected to beam clamp, UL-approved concrete inserts or Phillips or approved equal expansion shields. No ramset or shot shields will be allowed.

D. Hanger spacing shall meet requirements of state and local plumbing codes. In no case shall horizontal piping be supported at intervals greater than 10'-0".

E. Piping below basement or lowest level slab (that is, buried piping) need not be supported from structure if slab is not designed as structural slab.

F. Pipe supports, vertical and horizontal, shall not bear on sleeves.

G. Friction clamps shall be installed at base of plumbing risers and at each floor. Friction clamps shall not be supported from or rest on floor sleeves.

H. Horizontal piping shall be suspended from building by mild steel rod connecting pipe hanger to inserts, beam clamps, angle brackets and lag screws as required by Building Construction in accordance with the following:

Rod Size	Pipe Size
3/8"	0" to 2"
1/2"	2-1/2" to 3-1/4"
5/8"	4" to 5"
3/4"	6"
7/8"	8" to 10"

I. Hangers on insulated lines shall be sized to fit the outside diameter of pipe insulation. Provide pipe covering protection saddles at hangers on insulated lines.

J. Piping at equipment shall be supported to prevent strains or distortions in connected equipment and control valves. Piping at equipment shall be supported to allow for removal of equipment, valves, and accessories with a minimum of dismantling and without requiring additional support after these items are removed.

K. Piping installed under this Section shall be independently supported from building structure and not from piping, ductwork, conduit or other trades. Supplementary steel, including factory-fabricated channels, required to meet the requirements specified herein, shall be provided by the Plumbing Contractor.

L. Maximum spacing of hangers on waste pipe shall be 5' and hangers shall be provided at all changes in direction. Hanger rods to support piping from the structure or supplementary steel shall not exceed 4' in total length.

2.05 SLEEVES AND PENETRATIONS

A. Pipe Sleeves

1. Sleeves through floors and through structural and fire-rated construction shall be Schedule 40 steel.
2. Sleeves through partitions and non-fire-rated construction shall be 26 gauge galvanized steel with lock longitudinal seams, or approved plastic pipe.
3. Provide waterproofing membrane locking devices at floors. Provide 150 lb. slip-on welding flanges at exterior wall penetrations.

B. Fire stop penetration seals in fire-rated construction shall be ceramic fiber (Proset Systems Firefill); mineral fiber (Manville Thermo-mat); or silicone foam (Dow RTV 3-6548). Provide mineral fiber board, matting or putty for damming and forming. Finish seals flush to wall surface and fill gaps with silicone adhesive sealant caulking (Dow 96-081 RTV or approved equal).

C. Packing for sleeves that do not require maintenance of fire rating shall be oakum, silicate foam, ceramic fiber or mineral fiber with approved sealant. Pack or foam to within one inch of both wall surfaces. Seal penetration packing with approved caulking and paintable water-proof mastic surface finish or silicone caulking.

D. Other Water-proof Pipe Penetrations

1. Modular mechanical penetration seals shall be interlocking synthetic rubber links shaped to fill annular space continuously, with galvanized carbon steel bolts, nuts and pressure plates to expand rubber seal between pipe and sleeve. Sleeve seal shall be water-tight.
2. Prefabricated modular sleeves shall be Mason Industries (SWS) or approved equal stiffened galvanized steel sleeves with preformed closed-cell elastomeric seal (non-fire-rated) or preformed mineral fiber or silicone foam seal (fire-rated).
3. Provide water-proof 1" single ring set in silicone and bolted to floor or wall at chipped and drilled penetrations.

2.06 ESCUTCHEONS

A. Escutcheons shall be heavy cast brass, chromium-plated, adjustable, and shall be of sufficient outside diameter to cover sleeve opening and shall fit snugly around pipe.

PART 3 - EXECUTION

3.01 TESTING OF EXISTING ROOF DRAINS

A. Contractor shall test existing roof drains and storm drain piping and notify the Engineer of any deficiencies prior to starting work.

3.02 SPECIAL RESPONSIBILITIES

A. Coordination: Cooperate and coordinate with work of other Sections in executing work of this Section.

1. Perform work so that progress of entire project including work of other Sections is not interfered with or delayed.
2. Provide information as requested on items furnished under this Section which shall be installed under other Sections.
3. Obtain detailed installation information from manufacturers of equipment provided under this Section.
4. Obtain final roughing dimensions or other information as needed for complete installation of items furnished under other Sections or by Owner.
5. Keep fully informed as to shape, size and position of openings for material or equipment to be provided under this and other Sections. Give full information so that openings

required by work of this Section may be coordinated with other work and other openings and set sleeves in advance. In case of failure to provide sufficient information or set sleeves in proper time, provide cutting and patching to full satisfaction of Architect.

6. Provide information as requested as to sizes, number and locations of concrete housekeeping pads necessary for equipment provided under this Section.

B. Installation Only Items:

1. Where this contractor is required to install items which it does not purchase, it shall coordinate their delivery and be responsible for their unloading from delivery vehicles and for their safe handling and field storage up to the time of installation. This trade shall be responsible for:

a. Any necessary field assembly and internal connections, as well as mounting in place of the items, including the purchase and installation of all dunnage supporting members and fastenings necessary to adapt them to architectural and structural.
b. Their connection to building systems including the purchase and installation of all terminating fittings necessary to adapt and connect them to the building systems.

C. Maintenance of equipment and systems: Maintain equipment and systems until Final Acceptance. Ensure adequate protection of equipment and material during delivery, storage, installation and shutdown, and during delays pending final test of systems and equipment because of seasonal conditions.

D. Use of premises: Restrict use of premises as directed by Architect and as required below.

1. Remove dirt and debris, and keep premises clean. Upon completion of work, remove equipment and unused material. Put building and premises in neat and clean condition, and do cleaning and washing required to provide acceptable appearance and operation of equipment, to satisfaction of Architect and as specified under Cleaning Section 3.20.
2. It shall be this trade's responsibility to store his materials in a manner that will maintain an orderly clean appearance. If stored on-site in open or unprotected areas, all equipment and material shall be kept off the ground by means of pallets or racks, and covered with tarpaulins.
3. Do not interfere with function of existing sewers and water and gas mains and prevent debris from entering piping. Do not disrupt water services or other utilities for testing and connection of new work to existing.

E. Fireproofing:

1. Clips, hangers, clamps, supports and other attachments to surfaces to be fireproofed shall be installed, insofar as possible, before start of spray fiber work.
2. Piping and equipment that interfere with proper application of fireproofing shall be installed after completion of spray fiber work.
3. Patch and repair spray fireproofing cut or damaged during course of work specified under this Section. Trade responsible for damage shall bear cost of repair.

F. Temporary water supply and sanitary facilities: Special reference is made to Division 1 requirements for temporary facilities.

3.03 MATERIALS AND WORKMANSHIP

A. Work shall be neat and rectilinear. Piping shall run concealed except in mechanical rooms, stairways and areas without hung ceiling. Install material and equipment as recommended by manufacturer. Installation shall operate safely and without leakage. Work shall be properly and

effectively protected and pipe openings shall be temporarily closed to prevent obstruction and damage before completion.

B. Except as specified otherwise, material and equipment shall be new. Provide supplies, appliances and connections necessary for complete and operational installation. Provide components required or recommended by OSHA and NFPA.

C. References to manufacturers and catalog designations are intended to establish standards of quality for performance and materials but imply no further limitation of competitive bidding.

D. Finish of materials, components and equipment shall be as approved by Architect and shall be resistant to corrosion and weather as necessary.

3.04 INSTALLATION OF EQUIPMENT

A. Avoid interference with structure and with work of other Sections, to satisfaction of Architect, as required by codes and as necessary to meet manufacturer's installation and maintenance recommendations. Installation shall permit clearance for access to equipment for repair, servicing and replacement.

B. Distribute equipment loads properly on building structural members provided for equipment support under other Sections. Install and support roof-mounted equipment on structural steel provided under other Sections.

C. Provide hangers, supports, inserts, anchors, brackets, shelves, stands and legs as necessary for floor, wall or ceiling-mounted of equipment provided under this Section as shown on Drawings and as specified.

D. Provide steel supports and hardware for proper installation of hangers, anchors, guides, and other components.

E. Provide cuts, weights and other pertinent data required for proper coordination of equipment support provisions and installation.

F. Structural steel and supporting and hanging hardware shall meet ASTM Standards; use of steel and hardware shall meet requirements of Section Five of Code of Practice of American Institute of Steel Construction.

G. Verify site conditions and dimensions of equipment to ensure access for proper installation of equipment without disassembly that would affect warrantee. Report conditions that may prevent proper installation in writing before purchase or shipment of equipment.

3.05 ANCHORS AND INSERTS

A. Inserts shall be iron or steel of type to receive machine bolt head or nut after installation. Inserts shall permit adjustment of bolt in one horizontal direction and shall develop strength of bolt when installed in properly cured concrete.

B. Provide anchors as necessary for attachments of equipment supports and hangars.

3.06 PENETRATIONS AND SLEEVES

A. General

1. Provide pipe sleeves as specified and as shown on Drawings at penetrations of foundations, walls, slabs (except on-grade) partitions and floors. Sleeves shall meet NFPA-101 requirements and materials requirements of Part 2 of this Section.
2. Coordinate work carefully with architectural and structural work. Set sleeves in forms before concrete is poured. Provide core drilling as necessary to set sleeves if not set

before concrete is poured, and to set sleeves in existing construction. Do not penetrate structural members without Architect's approval.

3. Sleeves for insulated pipe shall accommodate continuous insulation without compression.
4. Sleeves through floors shall be water-tight and shall extend two inches above floor surface.

B. Pipe Sleeves

1. Annular space between pipe or pipe insulation and sleeve shall be at least 1/4".
2. Sleeves are not required for slab-on-grade unless specified otherwise.
3. Sleeves through rated fire walls and smoke partitions shall maintain fire rating of construction penetrated.
4. Do not support piping risers on sleeves.

C. Installation, Testing, Listings and Approvals

1. Installation shall meet material manufacturer's recommendations exactly, particularly as regards preparation of surfaces, removal of foreign material safety requirements, ventilation and other installation details. Dam openings as recommended. Remove flammable materials used for damming and forming seals in fire-rated construction.
2. Sleeve penetration methods shall be water- and gas-tight and shall meet requirements of ASTM E-119 Standard Methods of Fire Tests of Building Construction and Materials.
3. Fire-stop penetration seal methods and materials shall be FM-approved and UL-listed as applicable.
4. Inspect foamed sealants to ensure that installations achieve manufacturer's optimum cell structure and color ranges.

3.07 ESCUTCHEONS

A. Install escutcheons around exposed pipe passing through finished floor, wall, or ceiling. Escutcheons shall be heavy cast brass, chromium-plated, adjustable, and shall be of sufficient outside diameter to cover sleeve opening and shall fit snugly around pipe.

3.08 FLASHING AND COUNTER FLASHING

A. Provide counter flashing for roof penetrations required under this Section including vents and roof drains.

B. Flashing of vents, roof drains and other penetrations of roof required under this Section shall be done under other Sections.

3.09 JOINTS AND CONNECTIONS

A. Joints and connections shall be permanent and shall be gas- and water-tight. Jointing shall be type specified for service indicated. Joints and connections shall meet requirements of manufacturers best recommended practice. All transitions between different piping materials shall be made using approved adapters. Adapters for transitions between two types of piping materials shall be manufactured for purpose intended.

3.10 CORE DRILLING

A. Plumbing Contractor shall provide core drilling required for installation of plumbing systems if sleeves are not set before concrete is poured as follows:

1. Subcontractor shall carry costs for core drilling.

2. General Contractor shall not be responsible for any circular penetrations required for proper installation of plumbing systems.
3. Locate required openings and prior to coring, coordinate opening with General Contractor and other trades.
4. Do not disturb existing systems.
5. Thoroughly investigate existing conditions in vicinity of required opening prior to coring.
6. Subcontractor shall be responsible for damages to building and building systems from coring operations.

3.11 TESTING OF PIPING SYSTEMS

A. General

1. Piping systems shall be subjected to testing water or air as noted and shall hold tight at the pressure head stated for the time interval required without adding air or water. While any system is being tested, required head or pressure shall be maintained until joints are inspected.
2. Tests shall be witnessed by inspector having jurisdiction and the Architect with 48-hour notice given these authorities.
3. Equipment, material and labor required for testing of various systems or part thereof shall be provided by Plumbing Contractor.

B. Storm System

1. Provide pre construction testing of storm drain system. Report drain blockages and any deficiencies to Owner. Clear all blockages.
2. Provide post construction testing of storm drain system.
3. Testing of storm water piping systems on this project applies to all existing and new storm water piping systems.
4. Water test shall be applied to drainage systems either in their entirety or in sections as required, after rough piping has been installed.
5. If applied to entire system, openings in piping system shall be tightly closed, except the highest openings, and system filled with water to point of overflow.
6. If system is tested in sections, each opening shall be tightly closed except highest opening in the section under test, and each section shall be filled with water but no section shall be tested with less than 10' head of water.
7. In testing successive sections, at least upper 10' of next preceding section shall be tested so that no joint of piping in building, except the uppermost 10' of the system shall be submitted to a test of less than a 10' head of water.
8. Water shall be kept in system for at least 15 minutes before inspection starts; the system shall then be made tight at all points.

C. Points of drainage systems tested with air instead of water shall be tested by attaching an air compressor testing apparatus to suitable opening and, after closing all other inlets or outlets, forcing air into systems until a uniform gauge pressure of 5 psi of sufficient pressure to balance a column of mercury 10" high. Pressure shall be held without introduction of additional air for a period of at least 15 minutes.

D. Testing Summary

1. Storm - with water to a 10 foot head for 15 minutes.

E. Defective Work: If inspection or tests show defects, such defective work or material shall be replaced and inspection and tests shall be repeated. Repairs to piping shall be made with new material. No caulking of screwed joints or holes shall be acceptable.

F. Additional Tests

1. Provide additional tests such as smoke pressure tests as required by regulations or as directed by authorities making the inspection.
2. Provide for any repeated test as directed by the Architect, to make all systems tight as required.
3. Visual inspections of joints and valves shall be made as directed by the Architect.

3.12 CLEANING

A. Clean systems thoroughly before testing. Fixtures, equipment, pipe, valves and fittings shall be free of grease, metal, cuttings, dirt and other foreign material. Remove protective covers. Fixtures (including lavatories, water closets and urinals) shall be cleaned and ready for use. Final cleaning of fixtures to be performed by others.

B. Repair stoppages, discoloration and damage to parts of building, finish and furnishings due to failure to properly clean piping system within Contract Price.

C. After completion of project, clean the exterior surface of equipment included in this section, including concrete residue.

3.13 CONSTRUCTION WASTE MANAGEMENT

A. Comply with the requirements of Division 01 for removal and disposal of construction debris and waste.

END OF SECTION

SECTION 23 00 01

HEATING, VENTILATION AND AIR CONDITIONING

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.02 SCOPE OF WORK

A. Work included: Provide labor, materials and equipment necessary to complete the work of this Section and without limiting the generality thereof includes:

1. Prior to any demolition activities, all existing to be removed fans and rooftop units shall have airflows, static pressures, and amperages recorded and submitted to the Engineer for record. This pre-balancing report shall be used to verify existing unit operation. Any unit deficiencies or non-working equipment shall be reported to the Engineer prior to the start of demolition.
2. The existing rooftop equipment shall be clearly tagged and removed from the roof to accommodate roof replacement, unless stated otherwise.
    a. All work shall be coordinated with the roofer to ensure space can be left weather tight at the end of each day.
    b. Openings shall be capped weather tight until equipment is replaced.
    c. Upon completion of the roof replacement, the existing or new equipment shall be installed onto the roof in the original locations unless a new location is shown.
    d. All existing roof curbs will be demolished, and new insulated curbs will be provided, unless stated otherwise.
    e. Existing ductwork will be extended and modified to accommodate additional insulation thickness of the roof.
    f. Disconnect, make safe, and reconnect existing controls. Verify controls are still functioning after unit is reinstalled. If control wiring requires extensions, rewiring is required as splicing is not permitted.
3. New insulated roof curbs are to be provided by the mechanical contractor. Mechanical contractor shall coordinate with general contractor and electrical contractor for reinstallation of equipment. Mechanical contractor to be responsible for reconnection of equipment including controls. Electrical re-connection by 26 00 01.
4. Any rooftop unit that is to remain during roofing work, shall be protected from damage. All openings shall be sealed to keep unit clean.
5. Exhaust Fans
    a. Remove and store existing exhaust fans. Existing concrete curb existing to remain (unless otherwise noted). Temporarily seal and cap open ductwork during construction. Prepare all fans/ductwork for future connections. Reinstall existing fan on extended existing concrete curb and extend existing ductwork to connect to the fan. Connect to existing controls.
6. Gravity Ventilators / Roof Hoods

a. Remove and store existing roof hoods. Existing roof curb shall be existing to remain and provide a temporary cap for the roof opening. Reinstall existing hood and extend ductwork as necessary.

7. Rooftop Units

a. Remove and store existing rooftop units. Demolish and remove the existing roof curb. Temporarily seal and cap open ductwork during construction. Provide new insulated roof curbs for all RTUs and prepare ductwork for future connections. Reinstall existing RTU on new curb and extend existing ductwork to connect to the RTU. Connect to existing controls.

8. Disconnection of equipment and ductwork shall allow for roofing and flashing work to be performed by roofing contractor. Reconnection of equipment and ductwork shall be performed after installation of new roofing and flashing by roofing contractor.
9. New sleepers, support stands for condensing units, and insulated roof curbs are to be provided by the mechanical contractor. Mechanical contractor shall coordinate with general contractor and electrical contractor for reinstallation of equipment. Mechanical contractor to be responsible for reconnection of equipment. Electrical re-connection by 26 00 01.
10. Instruction/maintenance manuals and start-up services.
11. After all equipment has been (re)installed, provide testing and balancing of the system. For existing systems that have been reinstalled, the readings after installation shall be compared to the pre-balancing readings to verify proper operation has been achieved. New systems will fully tested and balanced, including at all outside air, supply air, and return air openings in the duct system.
12. Contractor shall field verify all sizes and locations and shall coordinate with the G.C.
13. Storage of all equipment and ductwork to be reinstalled shall be by the mechanical contractor. The owner and project manager shall be notified of any equipment that is damaged prior to removal. The mechanical contractor shall be responsible for replacing any equipment that is damaged during removal, storage, reinstallation, or otherwise. This shall include ductwork, piping, control wiring, etc. Mechanical contractor shall coordinate with roofer to work in a phased approach in an effort to keep the building weather tight. Equipment is to be identified to correspond with drawings and stored in closed container provided by this trade – no exterior tarp covered storage will be allowed.
14. Coordinate with electrical the removal and reinstallation of duct mounted smoke detectors or related fire alarm equipment.
15. Provide all hoisting, staging and rigging necessary for work.

B. Reference to Drawings, General:

1. The scope of the work to be performed under this Section is shown primarily on Mechanical Drawings; M-000, M101.1, M101.2, M201.1, M201.2, and M-400.
2. Refer to other Drawings and other sections of the specification which will indicate types of construction in which work shall be installed and work of other trades with which work of this Section must be coordinated.
3. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item, on the Drawings or in the Specifications or both, includes the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated as part of the indication or description.
4. Items referred to in singular number in Contract Documents shall be provided in quantities necessary to complete work.
5. The drawings are understood to be diagrammatic in nature. They are not intended to be absolutely precise; they are not intended to specify or to show every offset, fitting, or minor component. It shall be the responsibility of the Contractor to provide all necessary

components required for a complete system.

6. Where Drawings or Specifications conflict or are unclear, the Contractor shall include the greater of the two. Otherwise, the Engineer's interpretation of the Contract Documents shall be final, and no additional compensation shall be permitted due to discrepancies or unclarities thus resolved. The Engineer's interpretation shall be based on the stated requirement that all systems furnished under this Section 230001 be complete, automatically controlled, and tested and fully functional at the time of final inspection.
7. Where Drawings or Specifications do not coincide with manufacturer's recommendations, or with applicable codes and standards; the Contractor shall advise the Engineer in writing before installation. Otherwise, the Contractor shall be responsible for all changes to installed work as the Engineer shall require within the scope of the Contract at no additional cost to the owner.
8. If the required material, installation, or work can be interpreted differently from drawing to drawing, or between drawings and specs, this Contractor shall provide that material, installation, or work which is of the higher standard.
9. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Architect.
10. Where conflicts or potential conflicts exist and engineering guidance is desired, the Contractor shall submit sketch(es) of proposed resolution(s) to the Architect for review and approval.
11. As used in this Section, "provide" shall mean "furnish and install". "Furnish" shall mean "to purchase and deliver to the project site complete with all required accessories, components, materials, necessary appurtenances and supports," and "Install" shall mean "to unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location within the scope of this project."

C. Related Work: The following items of work are not included in this Section and are included under the relevant Section.

1. Electric power wiring for equipment: Section 260001 and Electrical Drawings.
2. Gas connects to RTUs: Section 22 00 01 and Plumbing Drawings.

1.03 RELATED WORK

A. Work related to this Section that will be executed by other Contractors under other Sections includes:

1. SECTION 075323 Roofing EPDM.
2. SECTION 076200 Sheet Metal Work, Flashing and Trim
3. SECTION 079200 Joint Sealants.
4. SECTION 260001 Electrical

1.04 INTENT

A. It is the intention of these Specifications and drawings to require the HVAC systems to be furnished complete in every respect, and this Contractor shall furnish all equipment needed as usually furnished in connection with such systems. Equipment, materials, and articles incorporated in the work shall be new and of the best grade of their respective kinds for the type of work involved. Authorized representatives of the manufacturer shall check field-assembled equipment.

1.05 CODES, ORDINANCES, AND PERMITS

A. The HVAC Subcontractor shall give all necessary notices, obtain all permits, and pay all taxes, fees and other costs in connection with his work; file all necessary plans, prepare all necessary documents and obtain all necessary approvals of state authorities, all local, town, city, or county departments having jurisdiction; obtain all required certificates of inspection for his work. No work shall be covered before examination and approval by Owner, inspectors and authorities having jurisdiction. Imperfect or condemned work shall be replaced with work conforming to requirements, without extra cost to the Owner, and subject to the approval of the Owner. If work is covered before due inspection and approval, the Contractor shall pay costs of uncovering the installed work, whether it meets contract requirements or not.

B. The HVAC Subcontractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, drawings in addition to Contract Drawings and Documents, in order to comply with all applicable laws, ordinances, rules and regulations whether or not shown on the drawings and/or specified.

C. All materials furnished and all work installed shall comply with the rules and recommendations of the Massachusetts State Building Code, the National Board of Fire Underwriters', National Fire Protection Association, Standards of Underwriter's Laboratories, National Electrical Manufacturers Association, all requirements of the Deerfield Fire Department, the local utility company, recommendations from the fire insurance rating organizations having jurisdiction, and with the requirements of all local, town, city, state or county departments having jurisdiction.

1.06 DEFINITIONS

A. "This Contractor" or "This Subcontractor" or “HVAC Subcontractor” means specifically the Subcontractor working under this Section of the Specifications.

B. "Furnish and Install” means to supply, erect, install and connect up, test, complete for regular operation, the particular referred to, unless otherwise specified.

1.07 SHOP DRAWINGS

A. Shop Drawings are drawings, diagrams, schedules and other data specifically prepared for Work in this project by Contractor, Subcontractor, manufacturer, supplier or distributor to illustrate portions of Work.

B. Submit to Engineer for approval copies of descriptive literature giving performance data, physical size, wiring diagrams, capacity, materials, etc.

C. Shop drawing submissions:

1. Coordinate submittal packages, review for compliance with Contract Documents and submit to Engineer for review. Submit transparency and three blues or black line reproduction of each Shop Drawing. After review, transparency original of each Shop Drawing will be returned with reviewer's marks.
2. Review submittals for each item and determine compliance with Contract Documents. Transmittal letter or form shall be evidence of submittal review. Submittals without transmittal letter or form will be returned without review.
3. Required submittals include:

    a. Insulated curbs

1.08 GUARANTEE

A. Contractor shall guarantee work under this Section in writing for two (2) years from date of Substantial Completion. Repair or replace defective materials, equipment, or workmanship that develops within this period at no additional expense to owner.

1.09 BASES AND SUPPORTS

A. Furnish and install all supplementary steel required for setting and/or hanging of piping, ductwork and equipment.

1.10 INSTRUCTION TO THE OWNER

A. All mechanical equipment installed in connection with this Section shall be put in operation in the presence of duly authorized representatives of the Owner with 24-hour notice given the Owner's representative for each appointment. Instructions shall be given to the Owner's employee appointed to familiarize himself with the systems and equipment. Provide the operating manual, parts list, and bulletin shall be delivered to the Engineer for approval. Refer to Section 001330 Submittals for additional requirements.

B. The manual shall include the following:

1. Summary description of the systems' operation.
2. Manufacturers' literature, illustrations, and technical data.
3. Guarantee and warranty data.
4. Parts list and parts number.
5. Maintenance, lubrication, and replacement charts.
6. Trouble-shooting charts.
7. System operating instructions.
8. Names, addresses and telephone numbers of all suppliers of equipment.

PART 2 - PRODUCTS

2.01 DUCTWORK AND AIR DISTRIBUTION EQUIPMENT

A. Reference Standards

1. Material, construction and installation shall meet requirements of most recent editions of the following standards and references, except for more stringent requirements specified or shown on Drawings:
2.

Standard	As Applicable To:
SMACNA HVAC Duct Construction Standards Metal and Flexible	Sheet Metal Ductwork; Duct Liners; Adhesives; Fasteners; Flexible Ductwork.

B. General

1. The only new ductwork in this project is to extend existing duct into the new roof curbs and to remove and re-attach existing ductwork.
2. Provide vertical and horizontal supports as required by codes to meet minimum applicable earthquake resistance standards.
3. Ductwork shall be free from vibration under all conditions of operation. Dimensions shown on Drawings for lined ductwork are net inside dimensions. Increase ductwork to accommodate lining requirements.
4. Ductwork shall have pressure-velocity classifications as follow:

DUCT CONSTRUCTION CLASS	STATIC PRESSURE RATING	PRESSURE	SMACNA SEAL CLASS	SMACNA LEAKAGE CLASS	VELOCITY
2"	2"	Pos. or Neg.	B	12	2500 fpm or less
1"	1"	Pos. or Neg.	B	12	2500 fpm or less
½"	½"	Pos. or Neg.	B	12	2000 fpm or less
*for negative pressures over 3" w.g., refer to SMACNA Round and Rectangular Industrial Duct Construction Standards for joint and intermediate reinforcement requirements.					

a. Unless otherwise specified or shown on the drawings, the following pressure classifications shall be used for the types of ductwork listed below:

2" Class: All ductwork.

5. Sealing Requirements for Class B, Leakage Class 12, Galvanized, Non-Welded Aluminum or Non-Welded Stainless Steel, Ductwork.

a. Transverse Joints

1) During assembly seal all flanged transverse joints with sealing tape of quality equal to Hardcast Inc. 1902-FR. Corners shall be sealed as described by SMACNA and when applicable per manufacturer's published procedures.
2) Seal all non-flanged transverse joints with Hardcast Inc. Versa Grip 102 or approved equal.

b. Longitudinal Seams

1) Seal all longitudinal seams during ductwork fabrication with Hardcast Inc. Cold Seal 1001 or approved equal.

6. Support

a. Space hangers as required by SMACNA (8 ft max) for horizontal duct on 8 ft. centers, unless concentrated loadings require closer spacing.
b. Support vertical duct on each floor or slab it penetrates.
c. Supports for ductwork and equipment shall be galvanized unless specified otherwise.

7. Connections

a. Connect inlets and outlets of air handling units and fans to ductwork with flexible connections unless fan has vibration isolator mounts inside unit with flexible connections and no external vibration isolators. Exception: Do not use flex on life safety smoke exhaust fans.
b. Indoors, flexible connections shall be neoprene-coated fibrous glass fire retardant fabric, by Ventfabrics, or Durodyne. Outdoors, flexible connections shall be Dupont hypalon- coated fibrous glass fire-, weather-, and UV-resistant by Ventfabrics or Durodyne.
c. Secure flexible connections tightly to air handlers with metal bands. Bands shall be same material as duct construction.

d. Connections from trunk to branch ducts shall be as detailed on Drawings.

8. Construction

a. No sharp metal edges shall extend into air streams.
b. Install drive slips on air-leaving side of duct with sheet metal screws on 6" centers.
c. Spin in collars shall NOT be used for branch connections in 3" or higher pressure class ductwork.

9. Joints

a. Longitudinal lock seams shall be double-locked and flattened to make tight joints.
b. Make transverse joints, field connections, collar attachments and flexible connections to ducts and equipment with sheet metal screws or bolts and nuts. Do not use rivets and staples.

10. Prefabricated Transverse Duct Joints

a. Transverse joints in galvanized sheet metal ductwork may be made with galvanized gasketed frame and angle duct joint system by Ductmate, TDF, TDC or approved equal. Angles shall be at least 20 gauge. Prefabricated transverse duct joints shall not be used for duct 16 GA. and heavier, nor for duct 23 GA. or lighter.
b. Secure angles to duct with screws (using clutched arbor) or spot-welds spaced as recommended by manufacturer for duct pressure class.

11. Elbows and Bends

a. Elbows and bends for rectangular ducts shall have centerline radius of 1-1/2 times duct width wherever possible. Elbows for grease exhaust and fume hood exhaust shall be full radius. Vanes or mitered duct are not allowed.
b. Where centerline radius is less than 1-1/2 times duct width (on supply, return and exhaust ductwork), elbows shall be radius throat (square throat allowed when turning around column or other close objects) with radius heel. For elbows whose width is greater than 48 inches and/or where shown on plans, provide splitter vanes. Install vanes in accordance with SMACNA. Where multiple elbows are separated by less than ten duct diameters use splitter (full length) vanes.
c. For round ductwork provide stamped elbows, with centerline radii equal to 1-1/2 times duct diameter, or gored elbows as follows:

Elbow Angle	No. of Gores
0°-36°	2
37°-72°	3
73°-90°	5

d. Elbows for flat oval ducts shall have centerline radii equal to 1-1/2 times duct diameter in plane of bend, or gored elbows with gores as specified for round ducts.

12. Access Panels/Doors

a. Provide proper pressure and leakage rated, gasketed, duct mounted access panels/doors for the following items with minimum sizes, as indicated. Access doors shall be of double wall construction - doors in insulated ducts shall be insulated. Gauges of door materials, no. of hinges, no. and type of door locks

shall be as required by the SMACNA Duct Construction Standards. Hinged doors are not acceptable, screwed or bolted access panels are not acceptable. Doors shall be chained to frame with a minimum length of 6" to prevent loss of door. For seal Class A, access doors shall be leakage rated, neoprene gasketed UL 94 HF1 listed, DUCTMATE "sandwich" or approved equal. Door metal shall be the same as the attached duct material. For grease and high temperature ducts, door assembly shall be rated for 2300°F. The minimum sizes are:

1) Fire dampers - 12" x 12", or larger.
2) Combination Fire/Smoke dampers - 12" x 12", or larger.
3) Smoke dampers - 6" x 6" minimum.
4) Automatic control dampers - 6" x 6" minimum.
5) Manual volume dampers 2 sq. ft. and larger - 6" x 6" minimum.
6) Inlet side to all coils - 12" x 12", or larger.
7) Suction and discharge sides of inline fans - 24" x 24" minimum.
8) At additional locations indicated on drawings, or specified elsewhere - 12" x 12" minimum.

b. Generally access doors are not shown on the drawings, but shall be provided in accordance with the above.
c. Extractors shall have adjusting rod and locknut on outside of duct.

13. Materials

a. Sheet metal ducts shall be constructed of hot-dipped galvanized sheet metal with G90 Commercial coating according to ASTM 527 unless specified otherwise.
b. Stainless steel (SS) ductwork shall be 18 gauge for kitchen hoods; and as required by SMACNA for other ducts. Materials shall be 316/No. 4 finish for exposed duct, 304/No. 1 finish for concealed ducts. Joints and seams shall be welded as required by SMACNA Guidelines for Welding Sheetmetal.

C. 2" and Lower Pressure Class Ductwork - Rectangular

1. Ducts wider than 19" with more than 10 square feet of unbraced panel shall be beaded or cross-broken.
2. Internal stiffening struts shall only be used upon prior written approval of the Designer.
3. Make changes in duct size with tapered connections as required by SMACNA. Changes shall NOT exceed 30°from line of air flow. Take-off to the diffusers shall be 45° leading edge type or Bellmouth type.
4. Transverse joints shall be TDF/TDC or slip joints; use flat or standing seam according to SMACNA. Where duct size requires standing seam but space restrictions dictate flat seam, notify Designer prior to fabrication.

D. Joints

1. Joints shall be prefabricated type by TDC, TDF or Ductmate. See Prefabricated Joints paragraph for specific requirements.
2. Duct reinforcement spacing and type shall comply with SMACNA.
3. Ductwork on both sides of transitions shall be run in same horizontal axis.
4. Diverging section slope shall be 1-1/2" per foot or less if possible.
5. Contraction section slope shall not exceed 7" per foot.
6. Takeoffs shall be 45° leading edge type except that Bellmouths (Buckley or equal) may be used for takeoffs to terminal boxes if the distance between the box and point of takeoff is less than 8 ft.
7. Ducts with an aspect ratio greater than 3:1 shall be minimum of 18 gauge unless a thicker gauge is required by SMACNA.

2.02 DUCT INSULATION

A. General

1. Insulation shall be Certain-Teed, Knauf, Manville or Owens Corning. Install insulation, mastics, adhesives, coatings, covers, weather-protection and other work exactly as required by manufacturer's recommendations. Materials shall meet requirements of Adhesive and Sealant Council Standards and SMACNA.
2. Apply insulation after systems have been tested, proved tight and approved by Engineer. Remove dirt, scale, oil, rust and other foreign matter prior to installation of insulation.
3. Leaks in vapor barrier or voids in insulation will not be accepted.
4. ASTM E-84 minimum fire hazard ratings shall be 25 flame spread, 50 fuel contributed and 50 smoke developed.
5. Where ducts are insulated, flexible connections to ducts shall be insulated.
6. Insulate standing seams with same material and thickness as duct.
7. Acoustically lined ductwork shall not be insulated externally, except as noted otherwise.
8. Return ductwork in ceiling plenums shall not be insulated.
9. Insulation shall be continuous through wall and ceiling openings and in sleeves.
10. Transmission rates of vapor barriers shall not exceed 0.02 perms.
11. Do not insulate fibrous glass duct.

B. Outdoor Rectangular Duct Insulation and Water-proofing

1. Provide 3" thick, semi-rigid fibrous glass boards with factory-applied fire retardant foil-reinforced kraft vapor barrier facing and aluminum jacket.
2. Insulation density shall be 3 lb./cf with maximum K-factor of 0.23 at 75°F mean temperature.
3. All insulation shall be R-12 installed. Increase thickness or density as listed above as required to achieve R-12 installed value.
4. Impale insulation on mechanical fasteners applied to duct surface on 12" centers. Use at least two rows of fasteners on each side of duct. Provide fastener rows within 3" of seams and edges. Secure insulation with suitable speed washers or clips firmly embedded in insulation. Provide additional fasteners as necessary on cross-broken ducts.
5. Extend insulation to standing seams, reinforcing, and other vertical projections 1" and less; do not carry over. Vapor barrier jacket shall be continuous across seams, reinforcing and projections. Insulation and jacket shall be carried over projections that exceed insulation thickness.
6. Transverse joints shall be butted tightly. Longitudinal joints shall be butted, ship-lapped or 45°mitered. Seal joints with 4" wide strips of approved vapor barrier patch material and adhesive, or with approved pressure sensitive vapor barrier tape.
7. Cover breaks, ribs and standing seam penetrations with patch of jacket material no less than 2" beyond break; secure with adhesive and staple. Seal staples and joints with brush-coat of vapor barrier coating.
8. Fill voids in insulation at jacket penetrations and seal with vapor barrier coating.
9. Seal and flash-terminations and punctures with fibrous glass cloth between two coats of vapor barrier coating.
10. Terminate vapor barrier and extend insulation at standoff brackets.
11. Provide corner angles on exposed corners of insulation. Apply two coats of weatherproof mastic coating with glass cloth embedded between coats. Glass cloth overlaps at joints and adjoining surfaces shall be at least 2". Total dry film thickness shall be 1/8".
12. Provide aluminum jacket with 2" lapped joints on all ductwork. Secure with bands at circumferential laps and at 12" intervals. Orient longitudinal laps to shed water. Fill transverse joints and longitudinal seams with weather-proof coating. Seal joints with

weatherproof coating where vapor barrier abuts uninsulated surface. Factory-fabricated longitudinal Pittsburgh Z-joint with bands that seal transverse joints and hold jacket in place may be used.

2.03 SLEEVES AND PENETRATIONS

A. Duct Sleeves and Openings

1. Sleeves through floors, through exterior structure, through fire-rated construction and through smoke partitions that require smoke dampers shall be Schedule 40 galvanized steel pipe for round duct and shall meet SMACNA Fire Damper and Heat Stop Guide for rectangular and flat oval ducts. Fireproof packing shall be applied to seal any openings between sleeve and wall. Materials shall maintain the fire rating of the wall, and shall be installed in accordance with the SMACNA Fire Damper and Heat Stop Guide.
2. Openings in walls, partitions and other fire-rated construction that do not require smoke dampers shall meet NFPA 90A, Section 3-3.8.
3. Materials for prepared openings in partitions shall match construction penetrated.

B. Other Water-proof Pipe Penetrations

1. Modular mechanical penetration seals shall be interlocking synthetic rubber links shaped to fill annular space continuously, with galvanized carbon steel bolts, nuts and pressure plates to expand rubber seal between pipe and sleeve. Sleeve seal shall be water-tight.
2. Prefabricated modular sleeves shall be Mason Industries (SWS) or approved equal stiffened galvanized steel sleeves with preformed closed-cell elastomeric seal (non-fire-rated) or preformed mineral fiber or silicone foam seal (fire-rated).
3. Provide water-proof 1" single ring set in silicone and bolted to floor or wall at chipped and drilled penetrations of existing slabs on grade and existing walls below grade.

PART 3 - EXECUTION

3.01 SPECIAL RESPONSIBILITIES

A. Coordination: Cooperate and coordinate with work of other Sections in executing work of this Section.

1. Perform work such that progress of entire project including work of other Sections shall not be interfered with or delayed.
2. Provide information as requested on items furnished under this Section which shall be installed under other Sections.
3. Obtain detailed installation information from manufacturers of equipment provided under this Section.
4. Obtain final roughing dimensions or other information as needed for complete installation of items furnished under other Sections.
5. Keep fully informed as to shape, size and position of openings required for material or equipment to be provided under this and other Sections. Give full information so that openings required by work of this Section may be coordinated with other work and other openings and may be provided for in advance. In case of failure to provide sufficient information in proper time, provide cutting and patching or have same done, at own expense and to full satisfaction of Engineer.
6. Notify Engineer of location and extent of existing piping, ductwork and equipment that interferes with new construction. In coordination with and with approval of Engineer, relocate piping, ductwork and equipment to permit new work to be provided as required by Contract Documents. Remove non-functioning and abandoned piping, ductwork and equipment as directed by Engineer. Dispose of or store items as requested by Engineer.

B. Maintenance of equipment and systems: Maintain HVAC equipment and systems until Final Acceptance. Ensure adequate protection of equipment and material during delivery, storage, installation and shutdown and during delays pending final test of systems and equipment because of seasonal conditions.

C. Use of premises: Use of premises shall be restricted as directed by Engineer and as required below.

1. Remove and dispose of dirt and debris, and keep premises reasonably clean. Upon completion of work, remove equipment and unused material. Put building and premises in neat and clean condition, and do cleaning and washing required to provide acceptable appearance and operation of equipment, to satisfaction of Engineer and as specified under CLEANING paragraph.
2. It shall be this trade's responsibility to store his materials in a manner that will maintain an orderly clean appearance. If stored on-site in open or unprotected areas, all equipment and material shall be kept off the ground by means of pallets or racks, and covered with tarpaulins.
3. Do not interfere with function of existing sewers and water and gas mains. Extreme care shall be observed to prevent debris from entering ductwork. Confer with Engineer as to disruption of heating services or other utilities due to testing or connection of new work to existing. Interruption of heating services shall be performed at time of day or night deemed by Engineer to provide minimal interference with normal operation. Obtain Engineer ’s approval of the method proposed for minimizing service interruption.

D. Surveys and measurements:

1. Base measurements, both horizontal and vertical, on reference points established by Contractor and be responsible for correct laying out of work.
2. In event of discrepancy between actual measurements and those indicated, notify Engineer in writing and do not proceed with work until written instructions have been issued by Engineer.

E. Fireproofing:

1. Clips, hangers, clamps, supports and other attachments to surfaces to be fireproofed shall be installed, insofar as possible, prior to start of spray fiber work.
2. Ducts, piping and other items which would interfere with proper application of fireproofing shall be installed after completion of spray fiber work.
3. Patching and repairing of spray fireproofing due to cutting or damaging to fireproofing during course of work specified under this Section shall be performed by installer of fireproofing and paid for by trade responsible for damage and shall not constitute grounds for an extra to OWNER.

3.02 MATERIALS AND WORKMANSHIP

A. Work shall be neat and rectilinear.

B. Except as specified otherwise, material and equipment shall be new. Provide supplies, appliances and connections necessary for complete and operational installation. Provide components required or recommended by OSHA and applicable NFPA documents.

C. References to manufacturers and to catalog designation, are intended to establish standards of quality for materials and performance but imply no further limitation of competitive bidding.

D. Finish of materials, components and equipment shall be as approved by Engineer and shall be resistant to corrosion and weather as necessary.

E. OWNER will not be responsible for material and equipment before testing and acceptance.

3.03 CONTINUITY OF SERVICES

A. Do not interrupt existing services without the Architect's approval.

B. Schedule interruptions in advance, according to the Architect's instructions. Submit, in writing, with request for interruption, methods proposed to minimize length of interruption.

C. Interruptions shall be scheduled at such times of day and work so that they have minimal impact on the User Agency's operations.

3.04 TAGS

A. Upon completion of work, attach engraved laminated tags to all valves (listed in the valve directory called for in the "Bulletins, Manuals and Instructions" paragraph of these specifications) and all pieces of HVAC equipment (including but not limited to pumps, fans, air handlers, coils and all other equipment listed in the HVAC schedules). Valve tags shall have black characters on white face, consecutively numbered and prefixed by letter "V". Equipment tags shall have black characters on white face, with labels corresponding to drawing schedule numbers.

B. Embossed or engraved aluminum or brass tags may be substituted if desired. Tags shall be at least 1/8" thick.

C. Valve tags shall be at least 1" in diameter with numerals at least 3/8" high and attached by "S" hooks or chains. Equipment tags shall be at least 2" diameter securely attached to apparatus.

D. Provide manufacturers equipment nameplates, catalog numbers and rating identification securely attached to electrical and mechanical equipment with screws or rivets. Adhesives or cements will not be permitted.

3.05 INSTALLATION OF EQUIPMENT

A. Avoid interference with structure and with work of other trades, preserving adequate headroom and clearing doors and passageways, to satisfaction of Engineer and in accordance with code requirements. Installation shall permit clearance for access to equipment for repair, servicing and replacement.

B. Install equipment so as to properly distribute equipment loads on building structural members provided for equipment support under other Sections. Roof-mounted equipment shall be installed and supported on structural steel provided under other Sections.

C. Provide suspended platforms, strap hangers, brackets, shelves, stands or legs as necessary for floor, wall or ceiling mounting of equipment provided under this Section (e.g. heating and ventilating units, fans, ducts and piping) as indicated on Drawings and in Specifications.

D. Provide steel supports and hardware for proper installation of hangers, anchors, guides, etc.

E. Provide cuts, weights, and other pertinent data required for proper coordination of equipment support provisions and installation.

F. Structural steel and hardware shall conform to Standard Specifications of ASTM; use of steel and hardware shall conform to requirements of Section Five of Code of Practice of American Institute of Steel Construction.

G. Verify site conditions and dimensions of equipment to ensure access for proper installation of equipment without disassembly which will void warrantee. Report in writing to Engineer, prior to purchase or shipment of equipment involved, on conditions which may prevent proper installation.

3.06 CLEANING

A. Ductwork

1. Provide temporary connections required for cleaning. Provide cheesecloth for openings during cleaning.
2. Replace filters prior to final inspection and testing.

B. Equipment

1. After completion of project, clean the exterior surface of equipment included in this section, including concrete residue.

3.07 STARTUP, TESTING AND BALANCING

A. General

1. Provide qualified personnel, equipment, apparatus and services for start-up, testing and balancing of mechanical systems, to performance data shown in schedules, as specified, and as required by codes, standards, regulations and authorities having jurisdiction including City Inspectors, Owners and Engineer. Note that some ATC start-up procedures listed below require the cooperation of the balancing contractor and the rooftop unit manufacturer's representative (if rooftop units are involved) and some balancing procedures require the cooperation of the ATC contractor and the rooftop units manufacturer representative (if appropriate). Ensure that all contractors are present on site during the entire time that these procedures take place. Note that some procedures listed below have a distinct order of precedence, e.g., the testing of the temperature control system shall not occur until major pieces of mechanical equipment have been started up and testing is complete. Ensure that any listed orders of precedence for procedures are followed.
2. Startup, testing and balancing shall not diminish guarantee requirements.
3. Notify Engineer and authorities involved at least two weeks before startup testing and balancing begins.
4. Provide prebalance of existing roof top system to compare to final balance of system.
5. Do not cover or conceal work before testing and inspection and obtaining approval.
6. Instruments for testing and balancing shall have been calibrated within one month prior to testing and balancing. Calibration shall be traceable to NBS Standards. Provide Photostat of certificate of calibration to Engineer’s representative at meeting demonstrating balancing procedures mentioned in Paragraph 4 above.
7. Leaks, damage and defects discovered or resulting from startup, testing and balancing shall be repaired or replaced to like-new condition with acceptable materials. Tests shall be continued until system operates without adjustments or repairs.
8. Report on reporting forms, submitted to Engineer for approval in advance, and on forms provided by Engineer.
9. For each piece of equipment, copy nameplate data and include in report.
10. Submit six copies of testing and balancing reports to Engineer for approval.
11. Provide capacity and performance of equipment by field testing. Install equipment and instruments required for testing, thermo-wells and gauge connections at no additional cost to OWNER.
12. Qualified representative of equipment manufacturer shall be present at test.
13. Startup, testing and balancing procedures outlined below are the minimum effort required for the project. Contractor shall use any additional procedures he feels will be necessary to properly startup, test and balance the job.

END OF SECTION

SECTION 26 00 01

ELECTRICAL

PART 1. GENERAL

1.01 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Documents identified in Division 1.

1.02 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
   1. Receptacle replacement
   2. Replacement of wiring and conduit as necessary.
   3. Disconnection and reconnection of mechanical equipment
   4. Core drilling for the Work of this Section.
   5. Fire alarm device addition.
   6. Coordination drawings and record drawings and similar requirements.
   7. Demolition of wiring and conduit.
   8. Firestopping
   9. Provide all hoisting, staging and rigging necessary for work.

B. Alternates: Not Applicable.

C. Comply with requirements specified in Section 013300 – SUBMITTAL REQUIREMENTS.

D. Shop Drawing: Submittals shall include but not be limited to:
   1. Wiring and cables.
   2. Conduit.
   3. Replacement Breakers.
   4. Receptacles
   5. Fire alarm devices

1.03 REFERENCES

A. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any electrical item in the drawings or specifications for electrical work carries with it the instruction to furnish, install and connect the item as part of the electrical work, regardless of whether or not this instruction is explicitly stated.

B. It shall be understood that the specifications and drawings for electrical work are complimentary and are to be taken together for a complete interpretation of the electrical work except that indications on the drawings, which refer to an individual element of work, take precedence over the specifications where they conflict with same.

1.04 GUARANTEE/WARRANTY

A. Guarantee work of this Section in writing for two (2) years following the date of initial building occupancy or turning over of the building to the owner, whichever is earlier. Repair or replace defective materials, equipment, workmanship and installation that develop within this period.

1.05 REGULATORY REQUIREMENTS

A. Comply with all applicable federal and state laws, and all local codes, by-laws and ordinances.

B. Where provisions of the Contract Documents conflict with any codes, rules or regulations, the latter shall govern. Where the contract requirements are in excess of applicable codes, rules or regulations, the contract provisions shall govern unless the Designer rules otherwise.

C. Request inspections from authorities having jurisdiction, obtain all permits and pay for all fees and inspection certificates as applicable and/or required. All permits and certificates shall be turned over to the Owner at the completion of the work. Copies of permits shall be given to the resident engineer prior to the start of work.

D. Unless otherwise specified or indicated, materials and workmanship and equipment performance shall conform with the latest edition of the following standards, codes, specifications, requirements and regulations:

1. State Building Code
2. State Electrical Code
3. National Fire Protection Association (NFPA)
4. Local Town Regulations and By-laws
5. Underwriter's Laboratories, Inc. (UL)
6. National Electrical Manufacturer's Association (NEMA)
7. American National Standards Institute (ANSI)

E. All electrical work shall meet or exceed any other state and local codes and/or authorities having jurisdiction including all other standards indicated herein.

1.06 COORDINATION

A. Prior to roughing any electrical work to door hardware, conduct a meeting with GC, door hardware supplier, and Tyco to review all connections to door hardware, door access system and confirm vision of labor and all wiring connection. Provide written meeting minutes to confirm actions and decision.

B. HVAC, Plumbing, Fire Protection, and Electrical Drawings are diagrammatic. They indicate general arrangements of mechanical and electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structure and other trades and to meet architectural requirements.

C. Work shall be performed in cooperation with other trades on the project and so scheduled as to allow speedy and efficient completion of the work.

D. Furnish to other trades advance information on locations and sizes of all frames, boxes, sleeves and openings needed for their work, and also furnish information and shop drawings necessary to permit trades affected by the work to install same properly and without delay.

E. If any electrical work has been installed before coordination with other trades so as to cause interference with the work of such trades, all necessary adjustments and corrections shall be made by the electrical trades involved without extra cost to Owner.

F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Designer for review and approval.

G. Protect all materials and work of other trades from damage which may be caused by the electrical work, and repair all damages without extra cost to Owner.

1.07 MECHANICAL AND ELECTRICAL COORDINATION

A. Heating and Ventilating Subcontractor shall furnish and install various electrical items relating to the heating and ventilating equipment and control apparatus. The Electrical Subcontractor shall be required to connect power wiring to this equipment unless noted otherwise.

B. The Heating and Ventilating and Electrical Subcontractors shall coordinate their respective portions of the work, as well as the electrical characteristics of the heating and ventilating equipment.

C. All power wiring and local disconnect switches will be provided by the Electrical Subcontractor for the line voltage power. All control and interlocking wiring shall be the responsibility of the Heating and Ventilating Subcontractor.

D. 120V and above power wiring sources extended and connected to heating and ventilating control panels, transformers and switches shall be the responsibility of the Electrical Subcontractor. All low voltage thermostat, zone valve and any switch wiring shall be the responsibility of the Heating and Ventilating Subcontractor.

1.08 INSTALLATION REQUIREMENTS

A. The arrangement of all electrical work shown on the drawings is diagrammatic only and indicates the minimum requirements of the work. Conditions at the building including actual measurements shall determine the details of the installation. All work shall be laid out and installed so as to require the least amount of cutting and patching.

B. Check the architectural plans and specifications before ordering any material and equipment. Any discrepancies shall be brought to the attention of the Designer for his determination prior to proceeding with the work.

1.09 SLEEVES, INSERTS

A. Furnish and install all sleeves, inserts, anchor bolts and similar items to be set into masonry or concrete, as required for mechanical and electrical work. Internal diameter of sleeve shall be 2" larger than the outside diameter of the pipe or insulation covered line passing through it.

1.10 ACCESSIBILITY

A. Install all work such that parts requiring periodic inspection, operation, maintenance and repair are readily accessible.

B. Furnish all access panels appropriate to particular conditions, to be installed by trades having responsibility for the construction of actual walls, floors or ceilings at required locations.

1.11 SUPPLEMENTARY SUPPORTING STEEL

A. Provide all supplementary steelwork required for mounting or supporting equipment and materials.

B. Steelwork shall be firmly connected to building construction as required.

C. Steelwork shall be of sufficient strength to allow only minimum deflection in conformity with manufacturer's published requirements.

D. All supplementary steelwork shall be installed in a neat and workmanlike manner parallel to floor, wall and ceiling construction; all turns shall be made at forty-five and ninety degrees, and/or as dictated by construction and installation conditions.

E. All manufactured steel parts and fittings shall be galvanized.

1.12 TOOLS AND EQUIPMENT

A. Provide all tools and equipment required for the fabrication and installation of the mechanical and electrical equipment at the site.

1.13 RECORD DRAWINGS, PROJECT CLOSEOUT

A. Comply with requirements specified in Section 017000 – CONTRACT CLOSEOUT.

B. This trade shall submit the record set for approval by the fire and building departments in a form acceptable to the departments, when required by the jurisdiction.

C. Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer and make and model numbers of final equipment installation.

1.14 GUARANTEE/WARRANTY

A. Guarantee Work of this Section in writing for two (2) years following the date of Substantial Completion. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to Designer's satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.

1.15 QUALITY ASSURANCE

A. The requirements of the State Building Code and local regulations establish the minimum acceptable quality of workmanship and materials, and all work shall conform thereto unless more stringent requirements are indicated or specified herein.

B. All work shall comply with the latest editions of the codes as referenced herein.

C. Follow manufacturer's directions for articles furnished, in addition to directions shown on drawings or specified herein.

D. Protect all work, materials, and equipment from damage during process of work. Replace all damaged or defective work, materials and equipment without additional cost to Owner.

E. All equipment and materials for permanent installation shall be the products of recognized manufacturers and shall be new.

F. Equipment and materials shall:

1. Where normally subject to Underwriters Laboratory Inc. listing or labeling services, be so listed or labeled.
2. Be without blemish or defect.
3. Not be used for temporary light and power purposes.
4. Be in accordance with the latest applicable NEMA standards.
5. Be products which will meet with the acceptance of all authorities having jurisdiction over the work. Where such acceptance is contingent upon having the products examined, tested and certified by Underwriters or other recognized testing laboratory, the product shall be so examined, tested and certified.

G. Except for conduit, conduit fittings, outlet boxes, wire and cable, all items of equipment or material of one generic type shall be the product of one manufacturer throughout.

H. For items which are to be installed but not purchased as part of the electrical work, the electrical work shall include:

1. The coordination of their delivery.
2. Their unloading from delivery trucks driven into any point on the property line at grade level.
3. Their safe handling and field storage up to the time of permanent placement in the project.
4. The correction of any damage, defacement or corrosion to which they may have been subjected. Replacement if necessary shall be coordinated with Contractor who originally purchased the item.
5. Their field make up and internal wiring as may be necessary for their proper operation.
6. Their mounting in place including the purchase and installation of all dunnage, supporting members, and fastenings necessary to adapt them to architectural and structural conditions.
7. Their connection to building wiring including the purchase and installation of all termination junction boxes necessary to adapt and connect them to this wiring. Included also shall be the purchase and installation of any substitute lugs or other wiring terminations as may be necessary to adapt their terminals to the building wiring as called for and to the connection methods set forth in these specifications.

I. Items which are to be installed but not purchased as part of the electric work shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the electric work will be considered only if presented in writing within one week of the date of delivery to the project of the items in question. The electric work includes all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

1.16 FIRESTOPPING

A. Provide all fire stopping in accordance with Section 07 84 00 Firestopping.

PART 2. PRODUCTS

2.01 MANUFACTURERS

A. Product specifications are written in such a manner so as to specify what materials may be used in a particular location or application and therefore do not indicate what is not acceptable or suitable for a particular location or application. As an example: non-metallic sheathed cable is not specified; therefore, it is not acceptable.

B. For purpose of establishing a standard of quality and not for purpose of limiting competition, the basis of this Specification is upon specified models and types of equipment and materials, as manufactured by specified manufacturers.

C. In all cases, standard cataloged materials and systems have been selected. Materials such as lighting fixtures specially manufactured for this particular project and not part of a manufacturers standard product line will not be acceptable. In the case of systems, the system components shall be from a single source regularly engaged in supplying such systems. A proposed system made up of a collection of various manufacturers products will be unacceptable.

D. Where Specifications list manufacturer's names and/or "as approved" or "approved equal" by Designer, other manufacturers equipment will be considered if equipment meets Specification requirements and has all features of the specified items as are considered essential by Designer.

E. All materials shall be new and shall be UL listed.

2.02 RACEWAYS AND FITTINGS

A. Raceways - General:

1. No raceway shall be used smaller than 3/4" diameter. No conduit shall have more than three (3) 90° bends in any one run, and where necessary, pull boxes shall be provided. Intermediate metal conduit is not allowed.
2. Rigid metal conduit (RMC) conforming to, and installed in accordance with, Article 346 of NFPA 70 shall be heavy wall zinc coated steel conforming to American Standard Specifications C80-1. RMC shall be used for all exterior circuiting including circuiting on roof.
3. Thin wall conduit (EMT), conforming to, and installed in accordance with, Article 346 of NFPA 70 shall be zinc coated steel, conforming to industry standards. EMT shall be used for all interior circuiting.
4. For Wet locations and exterior spaces/ spaces subject to corrosion, provide Rigid Galvanized Steel Conduit (RGS), couplings and elbows: ANSI C80.1 and UL 6; hot-dip galvanized, rigid mild steel, zinc-coated on interior and exterior surfaces.
5. End Bell Fittings: Malleable iron, hot dip galvanized, threaded flare type with provisions for mounting to form.
6. Conduit End Bushings: Malleable iron type with molded-on high impact phenolic thermosetting insulation. Where required elsewhere in the contract documents, bushing shall be complete with ground conductor saddle and clamp. High impact phenolic threaded type bushings are not acceptable.
7. All other fittings and conduit bodies shall be of malleable iron construction and hot dip galvanized.
8. Liquid tight flexible metal conduit shall be used for connection to motors and HVAC equipment. All flexible connections shall include a grounding conductor.

2.03 WIRING MATERIALS

A. Building Wire and Cable shall be copper with 600V insulation, THWN for branch circuitry and XHHW for feeders.

B. Conductors shall be of soft drawn 98% minimum conductivity properly refined copper, solid construction where No. 10 AWG and smaller, stranded construction where No. 8 AWG and larger.

C. Exterior of wires shall bear repetitive markings along their entire length indicating conductor size, insulation type and voltage rating.

D. Exterior of wires shall be color coded, so as to indicate a clear differentiation between each phase and between each phase and neutral. In all cases, grounded neutral wires and cables shall be identified by the colors white or gray. In sizes and insulation types where factory applied colors are not available, wires and cables shall be color coded by the application of colored plastic tapes in overlapping turns at all terminal points, and in all boxes in which splices are made. Colored tape shall be applied for a distance of 6 inches along the wires and cables, or along their entire extensions beyond raceway ends, whichever is less.

E. Final connections to motors shall be made with 18" of neoprene sheathed flexible conduit.

F. Minimum branch circuit conductor size shall be No. 12 AWG installed in conduit. Motor control circuit wiring shall be minimum No. 14 AWG installed in conduit.

G. Other wires and cables required for the various systems described elsewhere in this section of the Specifications shall be as specified herein, as shown on the Contract Drawings, or as recommended by the manufacturer of the specific equipment for which they are used, all installed in conduit.

2.04 WIRING MATERIALS - 600V OR LESS SYSTEMS

A. Conductors shall be copper with 600V insulation, THWN for branch circuitry and XHHW for feeders.

B. Conductors shall be of soft drawn 98% minimum conductivity properly refined copper, solid construction where No. 10 AWG and smaller, stranded construction where No. 8 AWG and larger.

C. Exterior of wires shall bear repetitive markings along their entire length indicating conductor size, insulation type and voltage rating.

D. Exterior of wires shall be color coded, so as to indicate a clear differentiation between each phase and between each phase and neutral. In all cases, grounded neutral wires and cables shall be identified by the colors white or gray. In sizes and insulation types where factory applied colors are not available, wires and cables shall be color coded by the application of approved colored plastic tapes in overlapping turns at all terminal points, and in all boxes in which splices are made. Colored tape shall be applied for a distance of 6 inches along the wires and cables, or along their entire extensions beyond raceway ends, whichever is less.

E. Final connections to motors shall be made with 18" of neoprene sheathed flexible metal conduit.

F. Minimum conductor size shall be No. 12 AWG installed in conduit. Motor control circuit wiring shall be minimum No. 14 AWG installed in conduit.

G. Wiring materials shall be manufactured by Triangle, Republic, Anaconda, General Cable, or equal.

2.05 OUTLET, JUNCTION, PULL BOXES, AND WIRING TROUGHS FOR ALL SYSTEMS

A. Pull and Junction Boxes: Where necessary to terminate, tap off, or redirect multiple raceway runs or to facilitate conductor installation, furnish, and install appropriately designed boxes.

B. Boxes installed in dry locations shall be fabricated from code gauge steel assembled with corrosion resistant machine screws. Box size shall be as required by Code. Where intermediate cable supports are necessary because of box dimensions, provide insulated removable core brackets to support conductors. Junction boxes are to be equipped with barriers to separate circuits. Where splices are to be made, boxes shall be large enough to provide ample work space. All conductors in boxes are to be clearly tagged to indicate characteristics. Boxes shall be supported independently of raceways. Junction boxes in moist or wet areas shall be galvanized type. Boxes larger than 4 inches square shall have hinged covers. Boxes larger than 12 inches in one dimension will be allowed to have screw fastened covers, if a hinged cover would not be capable of being opened a full 90 degrees due to installation location.

C. Cast-Metal Outlet and Device Boxes: Provide for wet locations, corrosive locations, and all locations where RGS conduit is required. Boxes shall be NEMA FB 1, ferrous alloy, Type FD, with gasketed cover. Boxes installed inside or under mechanical equipment housing, such as under exhaust fan domes, shall be utilize wet location requirements.

2.06 WIRING DEVICES

A. Provide wiring device type plates for all wall mounted devices. All wall plates shall be smooth high impact nylon for all public areas, offices, classrooms, etc color as directed by the Designer. Provide galvanized steel for all Utility, Electric and Mechanical Rooms.

B. Wiring devices standard for the project (i.e., with no specific type indicated) shall conform to the following:

1. Visible part colors of wiring devices shall be as directed by the Designer for all public areas, offices, classrooms etc. Provide brown devices for all Utility, Electrical and Mechanical Rooms.
2. Exclude compact or "despard" type devices.

C. Standard duplex convenience receptacles shall be 125 volt, 20 amps, three wire (two circuit wires plus ground), "U bar" ground NEMA slot configuration 5 20R, specification grade with a one-piece ground assembly. Receptacles shall be mounted 18" to center line above finished floor unless noted otherwise.

1. Equal to Hubbell No. HBL5362.
2. Where indicated on plans provide receptacles with ground fault current interrupters, UL class A, 20A, 125V to be equal to Hubbell No. GF5352.

D. Nonstandard convenience receptacles and special purpose power supply receptacles shall be as listed on plans.

E. Devices and device plates for flush wall devices which are not integrally equipped with same, shall be as directed by the Designer.

F. For unfinished spaces, plates for surface mounted wall devices which are not integrally equipped with same, shall be galvanized sheet steel, formed raised type which does not overlap box. Where for switches, such plates shall have toggle guards.

G. Where more than one wiring device is indicated in the same location, the devices shall be mounted in gangs under a common wall plate.

H. Mount duplex convenience and power receptacles vertically with grounding posts at top of device unless otherwise indicated. Locate grounding post to left when horizontal mounting is indicated.

I. Wiring devices and associated hardware shall be manufactured by Arrow Hart, Leviton, or Pass and Seymour.

2.07 GROUNDING REQUIREMENTS

A. Ground all systems and equipment in accordance with best industry practice, the requirements of NFPA 70 and the following:

B. Establish a ground bonding connection from the effectively grounded structural building steel to each cold water mains entering the building. Each bonding connection shall consist of insulated conductors run in conduit.

C. Provide grounding bonds between all metallic conduits of the light and power system which enter and leave cable chambers or other non metallic cable pulling and splicing boxes. Accomplish this by equipping the conduits with bushings of the grounding type individually cross connected.

D. Bond metallic conduits containing grounding electrode conductors and main bonding conductors to the ground bus service enclosure and/or grounding electrode at both ends of each run utilizing grounding bushings and jumpers.

E. Provide grounding bonds for all metallic conduits of the light and power system which terminate in pits below equipment for which a ground bus is specified. Accomplish this by equipping the conduits with bushings of the grounding type connected individually to the ground bus.

F. Provide supplementary ground bonding where metallic conduits terminate at metal clad equipment (or at the metal pull box of equipment) for which a ground bus is specified. Accomplish this by equipping the conduits with bushings of the grounding type connected individually by means of jumpers to the ground bus. Exclude the jumpers where directed. This exclusion will be required where an isolated ground for electronic equipment is to be maintained.

G. Each grounding type bushing shall have the maximum ground wire accommodation available in standard manufacture for the particular conduit size. Connection to bushing shall be with wire of this maximum size.

H. Bonding conductors on the load side of the service device and equipment grounding conductors shall be sized in relation to the fuses or trip size of the overcurrent device supplying the circuit.

I. The central equipment for the fire protective alarm system and telephone system shall have its grounding terminal connected to the grounding electrode by means of a No. 6 green coded insulated conductor, run in 3/4" conduit. Utilize a ground clamp of a type specifically manufactured for the purpose.

2.08 PHASING AND COLOR CODING

A. The insulation or covering of each wire or cable shall be color coded so as to provide for circuit identification as specified below.

120/208 V Circuits	277/480V	Phase Circuits
Black	Brown	A
Red	Orange	B
Blue	Yellow	C
White	Grey	Neutral
Green	Green with Yellow Tracer	Equipment Ground

B. Color coding shall be achieved by one of the following methods:

1. The insulation or covering shall be coded during manufacture by use of one of the following methods:
   a. Colored compounds.
   b. Colored coatings.
2. In sizes and insulation types where factory applied colors are not available, wires and cables shall be color coded by the application of colored plastic tapes in overlapping turns at all terminal points, and in all boxes in which splices are made.

C. The same colored cable shall be connected to the same phase throughout the project.

D. In general, building load centers and panelboards shall be phased "A", "B", "C", left to right. The neutral, although it may be in different locations for different equipment, shall be identified.

2.09 MOLDED CASE CIRCUIT BREAKERS

A. Molded case type circuit breakers shall consist of manually operated quick make quick break mechanically trip free operating mechanisms for simultaneous operation of all poles, with contacts, arc interrupters and trip elements for each pole, all enclosed in molded phenolic plastic cases.

1. Their tripping units shall be of the "thermal magnetic" type having bimetallic elements for time delay overload protection and magnetic elements for short circuit protection.
2. They shall be manually operable by means of toggle type operating handles having "tripped" position midway between the "on off" position.
3. They shall each be contained in an individual case enclosing only the number of poles required for the particular breaker.
4. All panels and individually mounted circuit breakers shall have short circuit ratings exceeding the available short circuit or the values indicated in the Power System Studies in this section by a factor of 1.2 with a minimum as follows:
   a. 240V class panels/breakers
      a) 110 kAIC where shown fed by a 150 kVA or less transformer
      b) 222 kAIC where shown fed by a 300 kVA or less transformer
   b. 480V Class Panels/Breakers shall be 65 kAIC.
5. They shall be of the "bolted in" type.
6. Where necessary, to accommodate other requirements, their frame sizes shall be increased to conform to such requirements, frame sizes being indicated only as a reference to the minimum acceptable interrupting ratings noted above.
7. Where single pole in trip sizes 20 amps or less, they shall be rated for switching duty.
8. They shall be equipped with 5 milliamp sensitivity ground fault interrupting features where so indicated.

B. They shall be manufactured by Square D, Cutler Hammer, or General Electric.

2.10 FIRE ALARM

A. General: All new devices shall be compatible with the existing fire alarm system.

B. The project includes the addition of a fire alarm visual unit in a bathroom. Include a notification appliance circuit (NAC) expander cabinet for powering of visuals. Provide the services of a factory authorized Simplex technician to tie in devices to the system, reprogram, and test as required.

C. Notification Appliance Circuit (NAC) expander cabinet, Simplex 4009 series with standby batteries. Battery charger shall support either lead acid or nickel cadmium batteries of up to 110 AH. Provide power supplies to operate system under alarm – full load condition with 25 percent spare capacity. Battery charger circuit shall be capable of supervising batteries for low charge and disconnected conditions. Charger circuit shall be automatic and capable of recharging batteries to full capacity within 12 hour period.

D. System Devices

1. Provide analog/addressable devices where required. Device address shall be programmed using dip switches located in base of detectors.
2. Analog addressable sensors shall require two wires and be connected to addressable loop except where noted. Devices shall utilize LED indicators which flash during active polling cycle, and light steadily when in alarm condition. Common types of analog sensors shall be interchangeable with common twist-lock bases where applicable.

3. Analog addressable type smoke detectors shall have sensitivity continuously monitored. Control equipment shall evaluate sensitivity data for determination of sensitivity change and shall automatically provide environmental compensation to maintain constant detector sensitivity. It shall be possible to automatically or manually adjust analog detection sensitivity from any network node.

4. Analog Addressable Duct Smoke Detector: Simplex Model 4098-9714. Smoke obscuration sensitivity setting shall be within the guidelines of U.L..

5. Analog Addressable Duct Smoke Detector: Detector shall be supplied as a complete assembly with detector, smoke chamber, sampling tube and remote test/indicating station. Sampling tube shall be sized according to duct width. Detectors shall be equipped with auxiliary contacts rated at 2 AMPS 24 VDC, or remote auxiliary contacts rated for 10 amps at 24 VDC.

6. Addressable indicating circuit modules: Simplex Model 2190 Series used to activate indicating appliances connected to sub-circuit in response to command from control equipment. Module shall interface to alarm signaling appliances via supervised, Class A sub-circuit and shall be rated for 2 AMP output. Signaling appliances attached to sub-circuit shall report their status and be activated as single identity. Module shall be UL listed for use with conventional 25 volt speakers and ADA strobes.

7. Visual units: 24V. Xenon Flasher in clear lens, rectangular dome selectable from 15, 30, 75 or 110 candela. Word "FIRE" shall be imprinted in bold white lettering. Finish of device shall be Red.

8. Provide Simplex red surface back boxes for surface mounted devices.

PART 3. EXECUTION

3.01 BASIC REQUIREMENTS

A. Raceways routed on exterior of building, including routed on roof shall be RMC, except connections at motors shall be with liquid-tight flexible metal conduit.

B. Raceways routed on interior of building shall be EMT, except connections at motors shall be with liquid-tight flexible metal conduit

C. Adhere to best industry practice and the following.

D. Equip each raceway intended for the future installation of wire or cable with a nylon pulling cord 3/16 inch in diameter and clearly identify both ends of the raceway.

E. Provide all outlet boxes, junction boxes, and pull boxes for proper wire pulling and device installation. Include those omitted from the drawings due to symbolic methods of notation.

F. Utilize lugs of the limiter type to make connections at both ends of cables installed on the line side of main service overcurrent and switching devices. Provide cable limiters for each end of each service entrance cable.

G. Provide all sleeves through fireproof and waterproof slabs, walls, etc. required for electric work.

1. Provide waterproof sealing for the sleeves through waterproof slabs, walls, etc.
2. Provide fireproof sealing for the sleeves through fireproof walls, slabs, etc.
3. Provide fireproof sealing for the openings in fireproof walls, slabs, etc., resulting from removal of existing electrical sleeves, conduits, poke-throughs, etc.

H. Bundle wiring passing through pull boxes and panel boards in a neat and orderly manner with plastic cable ties. Cable ties shall by Ty-Raps as manufactured by Thomas & Betts, Holub Industries Inc., Quick Wrap, Bundy Unirap or equal.

I. Turn branch circuits and auxiliary system wiring out of wiring gutters at 90 degrees to circuit breakers and terminal lugs.

3.02 TESTING REQUIREMENTS AND INSTRUCTIONS

A. The Electrical Subcontractor shall provide supervision, labor, materials, tools, test instruments and all other equipment or services and expenses required to test, adjust, set, calibrate, and operationally check work and components of the electrical systems and circuitry throughout the work.

B. The Electrical Subcontractor shall pay for all tests specified in this Section, including expenses incident to retests occasioned by defects and failures of equipment to meet specifications, at no additional cost to Owner. Any defects or deficiencies discovered in any of the electrical work shall be corrected.

C. The Electrical Subcontractor shall:

1. Replace wiring and equipment found defective (defined as failing to meet specified requirements) at no additional cost to Owner.
2. Submit three copies of test results to the engineer.

D. Do not void equipment warranties or guarantees by testing and checkout work. Checks and tests shall be supplemental to and compatible with the manufacturer's installation instructions. Where deviations are apparent, obtain the manufacturer's approved review of procedure prior to testing. Where any repairs, modifications, adjustments, tests or checks are to be made, the Contractor shall contact the engineer to determine if the work should be performed by or with the manufacturer's representative.

1. All checks and tests specified for proper operating and safety of equipment and personnel are to be performed concurrent with progression of the work, prior to Final Acceptance by Owner.

E. Test are to:

1. Provide initial equipment/system acceptance.
2. Provide recorded data for future routine maintenance and trouble shooting.
3. Provide assurance that each system component is installed satisfactorily and can be expected to perform, and continue to perform, its specified function with reasonable reliability throughout the life of the facility.

F. At any stage of construction and when observed, any electrical equipment or system determined to be damaged, or faulty, is to be reported to the engineer. Corrective action by the Contractor requires prior engineer approval, retesting, and inspection.

G. Prior to testing and start-up, equipment and wiring shall be properly and permanently identified with nameplates, and other identification as specified in this Section. Check and tighten terminals and connection points, remove shipping blocks and thoroughly clean equipment, repair damaged or scratched finishes, inspect for broken and missing parts and review and collect manufacturer's drawings and instructions for delivery to the engineer. Make routine checks and tests as the job progresses to ensure that wiring and equipment is properly installed.

H. Testing and checkout work is to be performed with fully qualified personnel skilled in the particular tests being conducted. Personnel are to have at least five years of experience with tests of same type and size as specified:

I. Inspections and tests shall be in accordance with the following applicable codes and standards as amended to date, unless otherwise specified.

a. National Electrical Manufacturer's Association - NEMA.
b. American Society for Testing and Materials - ASTM.
c. Institute of Electrical and Electronic Engineers -IEEE.
d. National Electrical Testing Association - NETA.
e. American National Standards Institute - ANSI.
    a) C2: National Electrical Safety Code.
    b) Z244-1: American National Standard for Personnel Protection.
f. Insulated Cable Engineers Association - ICEA.
g. Association of Edison Illuminating Companies - AEIC.
h. Occupational Safety and health Administration.
    a) OSHA Part 1910; Subpart S, 1910.308.
    b) OSHA Part 1926; Subpart V, 1926.950 through 1926.960.
i. National Fire Protection Association - NFPA.
    a) 70B: Electrical Equipment Maintenance.
    b) 70E: Electrical Safety Requirements for Employer Workplaces.
    c) 70: National Electrical Code.
    d) 78: Lightning Protection Code.
    e) 101: Life Safety Code.

j. Inspections and tests shall utilize the following references:
   a) Contract Drawings and Specifications.
   b) Contractor's Short Circuit and Coordination Study.
   c) Manufacturer's printed test procedures for respective equipment.

J. Test Equipment:

1. Test equipment used by the Contractor is to be inspected and calibrated.
2. Perform calibration and setting checks with calibrated test instruments of at least twice that of that of the accuracy of the equipment, device, relay or meter under test. Dated calibration labels shall be visible on test equipment. Calibrations over 6 months old are not acceptable on field test instruments. Inspect test instruments for proper operation prior to proceeding with the tests. Record serial and model numbers of the instruments used on the test forms.

K. Test Procedures:

1. The Electrical Subcontractor is responsible for the preparation of the procedures and schedules for the work specified herein. This work is to be coordinated and compatible with both the work and schedule of the other crafts. Sequence the tests and checks so that the equipment can be energized immediately after the completion of the application tests.
2. Submit proposed testing and check out forms. The procedures shall provide specific instructions for the checking and testing of each electrical component of each system. Schedule tests and inspections as the job progresses. Test procedures submitted shall include job safety rules.

L. After each electrical system installation is complete, perform the tests to determine that the entire system is in proper working order and in accordance with applicable codes, manufacturer's instructions, drawings, and specifications. Tests are in addition to shop tests of individual items at the manufacturer's plant. Perform insulation and ground resistance tests before operating tests.

M. Perform insulation tests on electrical equipment, apparatus, cables, motors, generators, transformers, circuit breakers and switches, switchgear, motor control centers, and similar electrical equipment, at the following times and conditions:

1. Prior to energization and/or placing into service.
2. When damage to the insulation is suspected or known to exist.
3. After repairs or modifications to the equipment affecting the insulation.
4. Where lightning or other surge conditions are known to have existed on the circuit.

N. Make openings in circuits for test instruments and place and connect instruments, equipment, and devices, required for the tests. Upon completion of tests, remove instruments and instrument connections and restore circuits to permanent condition.

O. List each circuit and measured resistance as test data. Maintain record of insulation resistance values. Identify conductor, or equipment, date that value was taken and resistance value. Arrange information in tabular form and submit to Engineer.

P. Report inspections, tests, and calibrations in writing on engineer-approved reports/forms. The recorded data form shall have the signatures of the persons conducting the tests, authorized witnesses, and the engineer. The forms shall serve as the test and inspection checklist.

Q. When the electrical tests and inspections specified or required within this Section are completed and results reported, reviewed, and approved by the engineer, the Contractor may consider that portion of the electrical equipment system or installation electrically complete. The Contractor will then affix

appropriate, approved, and dated completion or calibration labels to the tested equipment and notify the engineer of electrical completion. If the engineer finds completed work unacceptable, he will notify the Contractor in writing of the unfinished or deficient work, with the reason for his rejection, to be corrected by the Contractor. The Contractor will notify the engineer in writing when exceptions have been corrected. The Contractor will prepare a "Notification of Substantial Electrical Completion" for approval by the engineer following engineer's acceptance of electrical completion. If later in-service operation or further testing identifies problems attributable to the Contractor, these will be corrected by the Contractor, at no additional cost to the Authority.

R. Specific Tests:

1. Perform the following specific tests. De-energize and isolate equipment and cable prior to performing the tests.
2. Motors:
   a. Before energizing any machine, visually inspect for serviceability. Check manufacturer's instruction manual for correct lubrication and ventilation. Align motor with driven equipment. Check nameplate for electrical power requirements.
   b. Test run motors uncoupled or unloaded, before placing into operation. Check the motor for rotation, speed, current and temperature rise under normal load and record the results. Maintain the proper color codes for phase identifications. This may require swaps at the motor for proper rotation. Use motor phase rotation meter prior to lead connection at motor in order to minimize later swaps.
3. Wire and Cable: (All conductors originating from main switchboard and distribution panels).
   a. Before energizing any cable or wire, megger the insulation resistance of every external circuit wire to each other and to ground. Tests shall be conducted at voltages of 500 volts or lower. Continuity test each wire and cable to verify the field applied tag per conductor. Minimum insulation resistance valves shall not be less than two megohms.
   b. Take insulation resistance measurements for motor feeders. With motors disconnected, measure insulation resistance from load side of contactors or circuit breakers.
   c. Check cables and wires for the proper identification numbering and/or color coding.
   d. Inspect cables for physical damage and proper connection in accordance with single line diagram.
   e. Motor Control
      a) Inspect for physical damage, proper anchorage and grounding.
      b) Compare equipment nameplate data with design plans or starter schedule.
      c) Motor Running Protection
         i) Compare overload heater rating with motor full load current rating to verify proper sizing.
         ii) If motor running protection is provided by fuses, verify proper rating considering motor characteristics.
         iii) Check tightness of bolted connections.
      d) Measure insulation resistance of each bus section phase-to-phase and phase-to-ground for one (1) minute.
      e) Measure insulation resistance of each starter section phase-to-phase and phase-to-ground with the starter contacts closed and the protective device open.
      f) Measure insulation resistance of each control circuit with respect to ground.
      g) Test motor overload units by injecting primary current through overload unit and monitoring trip time at three hundred percent (300%) of motor full load current.
      h) Perform operational tests by initiating control devices to affect proper operation.
      i) Bolt torque levels shall be in accordance with manufacturer's recommendations.

j) Perform insulation resistance test, 1000 VDC minimum test voltage and 100 megohms minimum insulation resistance.
k) Control wiring insulation test voltage shall be 1000V dc. Manufacturer shall be consulted for test voltage where solid state control devices are utilized.
l) Perform overload tests at three hundred percent (300%) of motor full load current. Trip times shall be in accordance with manufacturer's tolerances. Investigate values in excess of one hundred twenty (120) seconds.

3.03 BRANCH CIRCUITRY

A. All wiring in interior environment shall be EMT. All wiring in exterior environments and on roof shall be in rigid galvanized steel.

B. Feeder connections shall be in the phase rotation which establishes proper operation for all equipment supplied.

C. Reduced size conductors indicated for any feeders shall be taken as their grounding conductors.

D. Feeders consisting of multiple cables and raceways shall be arranged such that each raceway of the feeder contains one cable for each leg and one neutral cable, if any.

E. For circuitry indicated as being protected at 20 Amps or less, abide by the following:

1. All 20 amp, 120/208 volt, 3 phase, 4 wire combined branch circuit homeruns shall be provided with a #8 AWG neutral conductor.
2. Minimum conductor size shall be No. 12 A.W.G. copper.
3. Conductors operating at 120 volts extending in excess of 100 Ft., or at 277 volts extending in excess of 200 ft., or the last outlet or fixture tap shall be No. 10 A.W.G. copper throughout.

3.04 REQUIREMENTS GOVERNING ELECTRICAL WORK IN DAMP OR WET LOCATIONS AND ON ROOF.

A. Outlets and outlet size boxes shall be of galvanized cast ferrous metal only.

B. The finish of threaded steel conduit shall be galvanized only.

C. Wires for pulling into raceways for lighting and appliance branch circuitry shall be limited to "THWN".

D. Wires for pulling into raceways for feeders shall be limited to "THWN".

E. Plates for toggle switches and receptacles shall have gasketed snap shut covers suitable for wet locations while in use.

F. Final connections of flexible conduit shall be neoprene sheathed.

G. Apply one layer of half looped plastic electric insulating tape over wire nuts used for joining the conductors of wires.

H. Enclosures, junction boxes, pull boxes, cabinets, cabinet trims, wiring troughs and the like, shall be fabricated of galvanized sheet metal, shall conform to the following:

1. They shall be constructed with continuously welded joints and seams.

2. Their edges and weld spots shall be factory treated with cold galvanizing compound.
3. Their connection to circuitry shall be by means of watertight hub connectors with sealing rings.

I. Enclosures for individually mounted switching and overcurrent devices shall be NEMA Class IV weatherproof construction.

J. The covers, doors and plates and trims used in conjunction with all enclosures, pull boxes, outlet boxes, junction boxes, cabinets and the like shall be equipped with gaskets.

K. Panels shall be equipped with doors without exception.

L. The following shall be interpreted as damp or wet locations within building confines:

1. Spaces where any designations indicating weatherproof (WP) or vaporproof appear on the drawings.
2. Below waterproofing in slabs applied directly on grade.
3. Spaces defined as wet or damp locations by article 100 of the National Electric Code.

3.05 IDENTIFICATION AND TAGGING

A. Identify individually:

1. Each transformer.
2. Each panelboard.
3. Each switch and circuit breaker.
4. Each feeder, wire or cable of all systems.
5. Each switchboard.
6. Each end of nylon pullwire in empty conduit.

B. Each wire or cable in a feeder shall be identified at its terminal points of connection and in each pullbox, junction box and panel gutter through which it passes.

C. The nomenclature used to identify panelboards or load center shall designate the numbers assigned to them.

D. The nomenclature used to identify switches or circuit breakers shall:

1. Where they disconnect mains or services designate this fact.
2. Where they control feeders, designate the feeder number and the name of the load supplied.

3. Where they control lighting and appliance branch circuitry, designate the name of the space and the load supplied.

E. The nomenclature used to identify feeder wires and cables shall designate the feeder number.

F. Identification for panelboards or load centers shall be by means of engraved lamacoid nameplates showing 1/4" high white lettering on a black background fastened to the outside face of the front.

G. Identification for switches or circuit breakers shall be by means of the following:

1. Where individually enclosed engraved lamacoid nameplates showing 1/8" high white lettering on a black background fastened on the outside front face of the enclosure.

2. Where in panelboards or load centers without doors same as for individually enclosed.
3. Where in panelboards or load centers with doors typewritten directories mounted behind transparent plastic covers, in metal frames fastened on the inside face of the doors.

H. Identification for wires and cables shall be by means of wrap around "brady" type labels.

I. Device plates for local toggle switches, toggle switch type motor starters, pilot lights and the like, whose function is not readily apparent shall be engraved with 1/8" high letters suitably describing the equipment controlled or indicated.

J. Phase identification letters shall be stamped into the metal of the bus bars of each phase of the main busses of each switchboard and each panelboard. The letters shall be visible from at least one "normal posture" location without having to demount any current carrying or supporting elements.

K. Equip the front face of all switchboard pull boxes junction boxes and the like containing cables, busing or devices operating in excess of 600 volts with enameled sheet metal "red on white" signs reading "DANGER HIGH VOLTAGE."

L. Equip all electric closets and the like with enameled sheet metal "red on white" signs reading "Electrical Equipment Room No Storage Permitted." Signs shall be mounted at clearly visible locations within the rooms.

M. Provide a sign at the service entrance equipment room indicating the type and location of all on site emergency or standby power sources.

N. Identify each outlet box, junction box, and cabinet used in conjunction with empty raceway for wires of a future system by means of indelible markings on the inside denoting the system.

O. Prior to installing identifying tags and nameplates, submit their nomenclature for approval. Conform to all revisions issued by the Designer.

3.06 SUPPORTS AND FASTENINGS

A. Support work in accordance with best industry standards, Mass. Electric Code and the following:

B. Include supporting frames or racks for equipment, intended for vertical surface mounting, which is required in a free standing position.

C. Supporting frames or racks shall be of standard angle, standard channel or specialty support system steel members. They shall be rigidly bolted or welded together and adequately braced to form a substantial structure. Racks shall be of ample size to assure a workmanlike arrangement of all equipment mounted on them.

D. No work intended for exposed installation shall be mounted directly on any building surface. In such locations, flat bar members or spacers shall be used to create a minimum of 1/4" air space between the building surfaces and the work. Provide 3/4" thick exterior grade plywood painted with two coats of fire-retardant grey paint for mounting of panelboards.

E. Nothing (including outlet, pull and junction boxes and fittings) shall depend on electric conduits, raceways or cables for support.

F. Nothing shall rest on, or depend for support on, suspended ceiling media.

G. Support less than 2" trade size, vertically run, conduits at intervals no greater than 8 Ft. Support such conduits, 2-1/2" trade size or larger, at intervals no greater than the story height, or 15 Ft, whichever is smaller.

H. Where they are not embedded in concrete, support less than 1" trade size, horizontally run, conduits at intervals no greater than 7 ft.. Support such conduits, 1" trade size or larger, at intervals no greater than 10 ft.

I. Support all lighting fixtures directly from structural slab, deck or framing member.

J. Where fixtures and ceilings are such as to require fixture support from ceiling openings frames, include in the electric work the members necessary to tie back the ceiling opening frames to ceiling suspension members or slabs so as to provide actual support for the fixtures noted above.

K. As a minimum procedure, in suspended ceilings support small runs of circuitry (e.g., conduit not in excess of 1 inch trade size) from ceiling suspension members as defined above. Support larger runs of circuitry directly from structural slabs, decks or framing members.

L. Fasten electric work to building structure in accordance with the best industry practice.

M. Floor mounted equipment shall not be held in place solely by its own dead weight. Include floor anchor fastenings in all cases.

N. For items which are shown as being ceiling mounted at locations where fastenings to the building construction element above is not possible, provide suitable auxiliary channel or angle iron bridging tying to building structural elements.

O. As a minimum procedure, where weight applied to the attachment points is 100 lbs. or less, fasten to concrete and solid masonry with bolts and expansion shields.

P. As a minimum procedure, where weight applied to building attachment points exceeds 100 lbs., but is 300 lbs. or less, conform to the following:

1. At field poured concrete slabs, utilize inserts with 20' minimum length slip-through steel rods, set transverse to reinforcing steel.

3.07 SPLICING AND TERMINATING WIRES AND CABLES

A. Maintain all splices and joints in removable cover boxes or cabinets where they may be easily inspected.

B. Locate each completed conductor splice or joint in the outlet box, junction box, or pull box containing it, so that it is accessible from the removal cover side of the box.

C. Join solid conductors No. 8 AWG and smaller by securely twisting them together and soldering, or by using insulated coiled steel spring "wire nut" type connectors. Exclude "wire nuts" employing non expandable springs. Terminate conductors No. 8 AWG and smaller by means of a neat and fast holding application of the conductors directly to the binding screws or terminals of the equipment or devices to be connected.

D. Join, tap and terminate stranded conductors No. 6 AWG and larger by means of solder sleeves, taps; and lugs with applied solder or by means of bolted saddle type or pressure indent type connectors, taps and lugs. Exclude connectors and lugs of the types which apply set screws directly to

conductors. Where equipment or devices are equipped with set screw type terminals which are impossible to change, replace the factory supplied set screws with a type having a ball bearing tip. Apply pressure indent type connectors, taps and lugs utilizing tools manufactured specifically for the purpose and having features preventing their release until the full pressure has been exerted on the lug or connector.

E. Except where wire nuts are used, build up insulation over conductor joints to a value, equal both in thickness and dielectric strength, to that of the factory applied conductor insulation. Insulation of conductor taps and joints shall be by means of half lapped layers of rubber tape, with an outer layer of friction tape; by means of half lapped layers of approved plastic electric insulating tape; or by means of split insulating casings manufactured specifically to insulate the particular connector and conductor, and fastened with stainless steel or non metallic snaps or clips.

F. Exclude splicing procedures for neutral conductors in lighting and appliance branch circuitry which utilize device terminals as the splicing points.

G. Exclude joints or terminations utilizing solder in any conductors used for grounding or bonding purposes.

H. Exclude all but solder or pressure indent type joints in conductors used for signaling or communications purposes.

I. Lugs for conductors used to make phase leg connections on the line side of the main service overcurrent and switching device shall be of the limiter type.

3.08 PULLING WIRES INTO CONDUITS AND RACEWAYS

A. Delay pulling wires or cables in until the project has progressed to a point when general construction procedures are not liable to injure wires and cables, and when moisture is excluded from raceways.

B. Utilize nylon snakes or metallic fish tapes with ball type heads to set up for pulling. In raceways 2" trade size and larger, utilize a pulling assembly ahead of wires consisting of a suitable brush followed by an 3 1/2" diameter ball mandrel.

C. Leave sufficient slack on all runs of wire and cable to permit the secure connection of devices and equipment.

D. Include circular wedge type cable supports for wires and cables at the top of any vertical raceway longer than 20 feet. Also include additional supports spaced at intervals which are no greater than 10'. Supports shall be located in accessible pull boxes. Supports shall be of a nondeteriorating insulating material manufactured specifically for the purpose.

E. Pulling lubricants shall be used. They shall be products manufactured specifically for the purpose.

F. Slack on wires and cables located in cabinets and pull boxes shall be formed and set in place in groupings corresponding to their occupancy of raceways. They shall also be arranged, with insulators and supports provided where necessary, such that cable shims or other such temporary expedients do not have to be left permanently in place to prevent the wires and cables from shifting when covers or trims are removed.

3.09 REQUIREMENTS FOR THE INSTALLATION OF JUNCTION BOXES, OUTLET BOXES AND PULL BOXES

A. Flush wall mounted outlet boxes shall not be set back to back but shall be offset at least 12" horizontally regardless of any indication on the drawings.

B. Locate all boxes so that their removable covers are accessible without necessitating the removal of parts of permanent building structure, including piping, ductwork, and other permanent mechanical elements.

C. In conjunction with concealed circuitry, abide by one of the following instructions (as may be applicable to the conditions) in order to assure the aforementioned accessibility. (Not required for circuitry concealed by removable suspended ceiling tiles.)

1. For a small (outlet size) box on circuitry concealed in a partition or wall, locate box or fitting so that its removable cover side (or the face of any applied raised cover) penetrates through to within 1/8" a of the exposed surface of the building materials concealing the circuitry and apply a blank or device plate to suit the functional requirements.
2. For a large box on circuitry concealed in a partition, suspended ceiling, or wall, locate box totally hidden but with its removable cover directly behind an architectural access door or panel (included for the purpose, separate from the electric work) in the building construction which conceals the circuitry.
3. For a small (outlet size) box on circuitry concealed above and intended as an outlet for a surface mounted lighting fixture or other such electrical item, locate box so that its removable cover side penetrates through to the exposed surface of the building materials concealing the circuitry. Arrange the mounting of the lighting fixture or other item so that it completely covers the opening in the building construction caused by the box.
4. For a small (outlet size) box on circuitry concealed in a suspended ceiling, and intended as an outlet for a non demountable type of recessed lighting fixtures or other such electrical items, locate box totally hidden but with its removable cover not more than one foot away from the building construction opening occupied by the demountable items.

D. Apply junction and pull boxes in accordance with the following:

1. Include pull boxes in long straight runs of raceway to assure that cables are not damaged when they are pulled in.
2. Include junction and pull boxes to assure a neat and workmanlike installation of raceways.
3. Include junction and pull boxes to fulfill requirements pertaining to the limitations to the number of bends permitted in raceway between cable access points, the accessibility of cable joints and splices, and the application of cable supports.
4. Include all required junction and pull boxes regardless of indications on the drawings (which, due to symbolic methods of notation, may omit to show some of them).

E. Apply outlet boxes in accordance with the following:

1. Unless noted below or otherwise specifically indicated, include a separate outlet box for each individual wiring device, lighting fixture and signal or communication system outlet component. Outlet boxes supplied attached to lighting fixtures shall not be used as replacements for the boxes specified herein.
2. A continuous row of fixtures of the end to end channel type, designed for "through wiring," and wired in accordance with the specification hereinafter pertaining to circuitry through a series of lighting fixtures, may be supplied through a single outlet box.
3. A series of separate fixtures, designed for "through wiring," spaced not more than 4' apart, and inter connected with conduit or raceway and circuitry which is in accordance with the

specifications hereinafter pertaining to circuitry through a series of lighting fixtures, may be supplied through a single outlet box.

4. Connection to recessed ceiling fixtures supplied with pigtails may be arranged so that more than one, but not more than four, such fixtures are connected into a single outlet box. When adopting this procedure:
   a. Utilize an outlet box no smaller than 5" square by 2 1/2" deep.
   b. Allow no fixture to be supplied from an outlet box in another room.
5. Multiple local switches indicated at a single location shall be gang mounted in a single outlet box.
6. Include all required outlet boxes regardless of indications on the drawings (which due to symbolic methods of notation, may omit to show some of them).

F. Install junction boxes, pull boxes and outlet boxes in accordance with the following:

1. Exclude surface mounted outlet boxes in conjunction with concealed circuitry.
2. Exclude unused circuitry openings in junction and pull boxes. In larger boxes each such opening shall be closed with a galvanized sheet steel plate fastened with a continuous weld all around. In small outlet type boxes, utilize plugs as specified for such boxes.
3. Close up all unused circuitry openings in outlet boxes. Unused openings in cast boxes shall be closed with approved cast metal threaded plugs. Unused openings in sheet metal boxes shall be closed with sheet metal knock out plugs.
4. Outlet boxes for switches shall be located at the strike side of doors. Indicated door swings are subject to field change. Outlet boxes shall be located on the basis of final door swing arrangements.
5. Boxes and plaster covers for duplex receptacles shall be arranged for vertical mounting of the receptacle.
6. Equip outlet boxes used for devices which are connected to wires of systems supplied by more than one set of voltage characteristics with barriers to separate the different systems.

G. Barriers in junction and pull boxes of outlet size shall be of the same metal as the box.

H. Barriers in junction and pull boxes which are larger than outlet size shall be of the polyester resin fiberglass of adequate thickness for mechanical strength, but in no case less than 1/4" thick. Each barrier shall be mounted, without fastenings, between angle iron guides so that they may be readily removed.

3.10 LOCATING AND ROUTING OF CIRCUITRY

A. In general, all circuitry shall be run concealed except that it shall be run exposed where the following conditions occur:

1. Horizontally at the ceiling of permanently unfinished spaces which are not assigned to mechanical or electrical equipment.
2. Horizontally and vertically in mechanical equipment spaces.
3. Horizontally and vertically in electric equipment rooms.

B. Concealed circuitry shall be so located that building construction materials can be applied over its thickest elements without being subject to spalling or cracking.

C. Circuitry run exposed shall be routed parallel to building walls and column lines.

D. Exposed circuitry located overhead shall be run in a completely accessible manner on the underside of all piping and ductwork.

E. Circuitry run in suspended ceilings shall be routed parallel to building walls, column lines, etc.

F. Circuitry shall be routed so as to prevent electric conductors from being subject to high ambient temperature. Minimum clearances from heated lines or surfaces shall be maintained as follows:

1.	Crossing where uninsulated	3"
2.	Crossing where insulated	1"
3.	Running parallel where uninsulated	36"
4.	Running parallel where insulated	6"

G. Circuitry shall not be run in elevator shafts, hoistways, and the like. Where outlets for trail cables, pit lights, run be level lights, and the like, are involved, only the "final connection" outlet boxes themselves shall be located within or open into, the confines of the shaft.

H. Circuitry for miscellaneous systems indicated without notation as to location and routing shall be run as per the requirements and notations governing the adjacent light and power circuitry.

3.11 SELECTIVE DEMOLITION

A. Where devices and equipment are called out to be removed, all conduit, wiring and associated appurtenances, including junction boxes, mounting clips, fasters, strut and the like shall be removed. Refer to demolition drawings.

3.12 INSTALLING CIRCUITRY

A. The outside surface of circuitry which is to be embedded in cinder concrete shall be coated with asphaltum paint.

B. In runs of conduit or raceway including flexible limit the number of bends between cable access points to a total which does not exceed the maximum specified for the particular system. Where no such maximum is specified, limit the number to four right angle bends or the equivalent thereof.

C. In each conduit or raceway assigned for the future pulling in of wires, include a nylon drag cord. In raceways 2" trade size and larger, the cord shall be pulled in utilizing a suitable brush, followed by an 85% diameter ball mandrel ahead of the cord in the pulling assembly. In the event that obstructions are encountered, which will not permit the drag cord to be installed, the blocked section of raceway shall be replaced and any cutting and patching of the structure involved in such replacement shall be included as part of the electric work.

D. Circuitry shall be arranged such that conductors of one feeder or circuitry carrying "going" current are not separated from conductors of the same feeder or circuitry carrying "return" current by any ferrous or other metal. Where not within raceways, all "going" and "return" current conductors of one feeder or circuit shall be laces together so as to minimize induction heating of adjacent metal components.

E. Sleeves used where circuitry is to penetrate waterproof slabs, decks and walls, shall be of a type selected to suite the water condition encountered in the field.

END OF SECTION